

# *The* **Tool Engineer**

MARCH 1954

HEAT TREATING

PUBLICATION OF THE AMERICAN SOCIETY OF TOOL



ENGINEERS



## The mooring mast that was never used!

**I**N MID MANHATTAN there stands a monument to a dream. A 1250-foot mooring mast that was never used!

When the Empire State Building was designed, the huge rigid-frame dirigible looked like the coming thing in air transportation. So, atop the world's tallest building, they placed a giant mooring mast. Yet before the building was finished, so was the dirigible balloon!

Why? It was knocked out of the race by the oldest law on the books. Darwin called it the survival of the fittest. We call it competition, but it means the same thing. In today's highly competitive market, it means that new ways *must be found* to produce a higher quality product, at lower cost.

That's where latest Heald equipment and a fresh Heald viewpoint can help you come out ahead in

the struggle for survival. Long runs or short, single or multi-purpose setups, Heald machines provide a sure way to improve product quality, speed production and cut unit costs.

Competition is wonderful if you're *ahead* of it. Our business is to help keep you there. That's why **IT PAYS TO COME TO HEALD.**



### THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Offices in Chicago • Cleveland • Dayton  
Detroit • Indianapolis • New York

Internal and Rotary Surface Grinding Machines and Bore-Mat

Cover: Controlled heat treating of parts is a vital link in the chain of production processes, involving both mechanical and metallurgical problems. Important to successful treatment on a production basis are the selection of furnaces and associated treating equipment. These are discussed in the article beginning on Page 45.



# The Tool Engineer

Volume XXXII, No. 3

March, 1954

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THE TOOL ENGINEER is regularly indexed in the  
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PLANNING · ENGINEERING · CONTROL · TOOLING · EQUIPMENT · PRODUCTION

**NOW!—DOWN TO 1/8"**

# Two New Dial Bore Gages for measuring 1/8" and 3/16" bores

Patent  
Applied  
For



These two new STANDARD developments extend the effectiveness of STANDARD Dial Bore Gages to quick, accurate, quantitative inspection of bores down to as small as 1/8" diameter. They utilize the "centering-size disc" principle, tested-in-use with similar but slightly larger gages.

- \* Hold settings positively
- \* Give reliable repeat readings
- \* Sapphire tipped gaging plungers and chrome-plated centering-size disc insure long gaging life
- \* High visibility dial graduations of .0001 are easy to read
- \* "Capstan" adjusting disc facilitates adjustment when zeroing instrument.

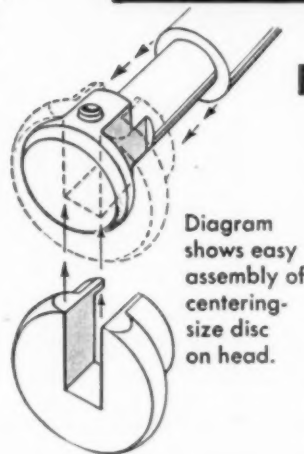


Diagram shows easy assembly of centering-size disc on head.

## EASY "SIZE CONVERSION"

Conversion to various sizes in the over-all range of the gage is accomplished by the quick interchange of centering-size discs on the same head simply by turning the knurled clamping nut. Positive interlocking action insures holding set dimension. Centering-size discs are furnished to fit bore dimensions specified by the user, or in complete sets.

## AVAILABLE AS ONE-DIMENSION OR FULL-RANGE GAGE

When either gage is supplied with set of discs, any dimension within its over-all range can be measured with a tolerance up to plus or minus .002".

**STANDARD Dial Bore Gages now in 10 sizes covering range from 1/8" to 16"**

Write for full details

## EASE OF OPERATION



Gage is entered at an angle to allow extended plunger to clear the bore, then rocked to cause plunger to pass a square position while noting minimum reading on the indicator.



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# The Tool Engineer

## Just Tighten Your Belt

Currently much speculation from the seers is casting ominous shadows on the industrial health of the country. In the over-all picture, nothing could be farther from reality. Yet, to those in the areas where layoffs have been necessary, hard times are real. Unchecked and overly magnified, these adverse local conditions could snowball and upset the industrial picture.

This should not happen. We are wont to brag about our ingenuity. Now is the time to use it and show the quality of our resourcefulness. The surface is only scratched with respect to possibilities of doing things better. If we have grown so soft that we panic easily and cannot stand the strains of our competitive system, it is too bad.

Competition requires that the best product be built in the best way and at the lowest cost. That is how our standard of living is raised without artificial stimulants. As competition grows keener, it becomes more necessary to improve production methods as well as to utilize machine tools and manpower to their best advantage. The luxury and extravagance of waste will be suicidal.

Our leaders who think in terms of trends have confidence in our industrial pattern and in its survival. Many companies have announced expansion and modernization programs, proving their confidence in the future.

In the lead article of this issue, Ralph Cross proposes a realistic modernization program as the key to prosperity. Also, the Kearney and Trecker Corp. have announced a tool-lease program, making possible for plants with limited capital to improve their competitive positions. Plans such as these indicate the resourcefulness necessary to keep industry in high gear without a wartime economy.

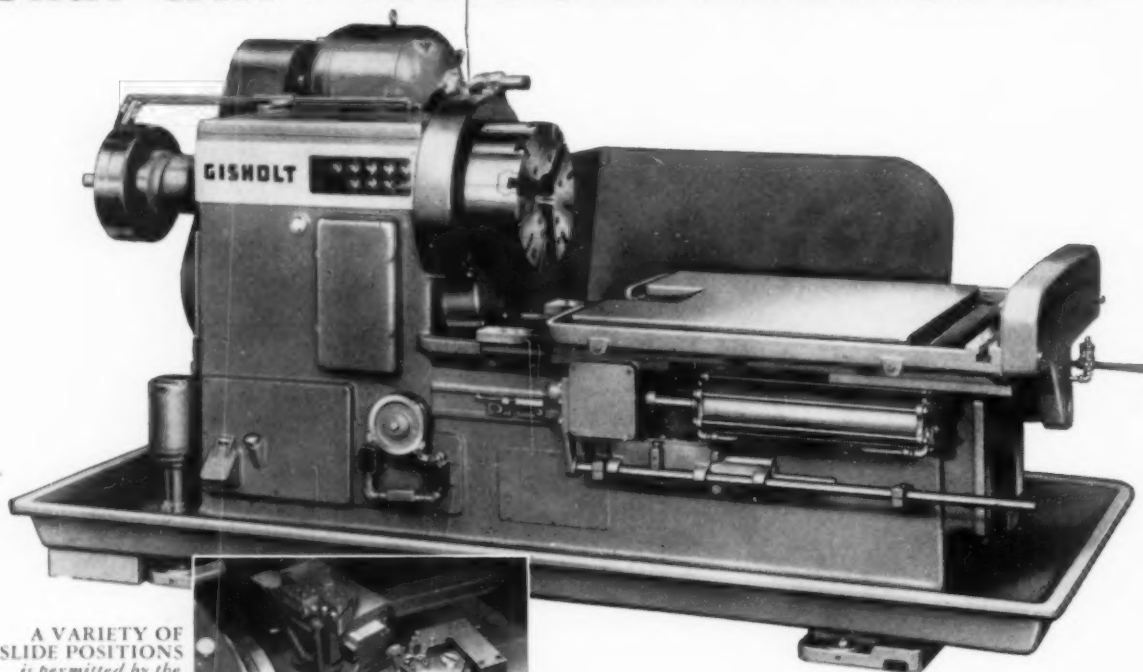
To meet the situation, we must tighten our belts and make sure that all operations are productive in terms of modern methods. If this is done there will be no question as to the future.

John W. Greve

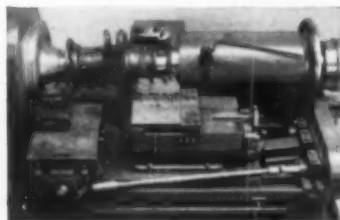
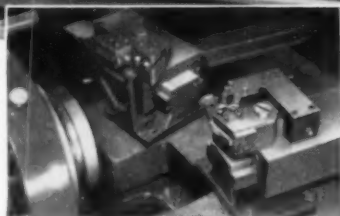
EDITOR



# What CAN'T these SIMPLIMATICS do?

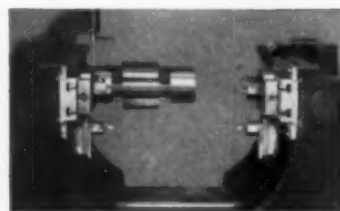
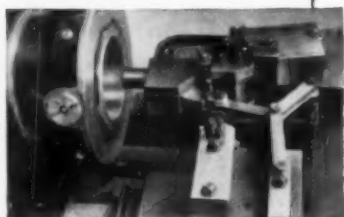


A VARIETY OF SLIDE POSITIONS is permitted by the large area of the platen table. Angular feeds are no problem. Compound slides are unnecessary.

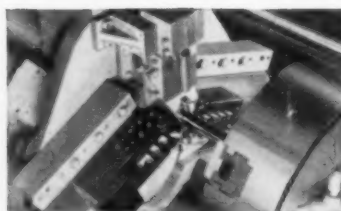


TAILSTOCKS can be mounted on platen table for between-centers work; can be operated by hand or pneumatically.

A LINKAGE ARRANGEMENT between the slides can be used for spherical boring in conjunction with facing and turning.



SIMULTANEOUS DOUBLE END MACHINING is possible with full utilization of base machine.



VERTICAL HEAD. Tool slides can also be mounted on a vertical instead of horizontal platen. A choice of arrangements is possible.

It's this simple basic design that makes the Simplimatic so readily adaptable to solve a variety of machining problems. It's a standard machine—yet it can be individualized to give you the high speed production of an automatic lathe designed solely for the job at hand. Think of the difference in cost.

The adaptations shown here are only a few of the almost unlimited possibilities of the Simplimatic. When you have a "special" job of machining parts in large volume, look into the Simplimatic before you build a special machine. The chances are good you'll save time and money.

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.



## GISHOLT

MACHINE COMPANY

Madison 10, Wisconsin

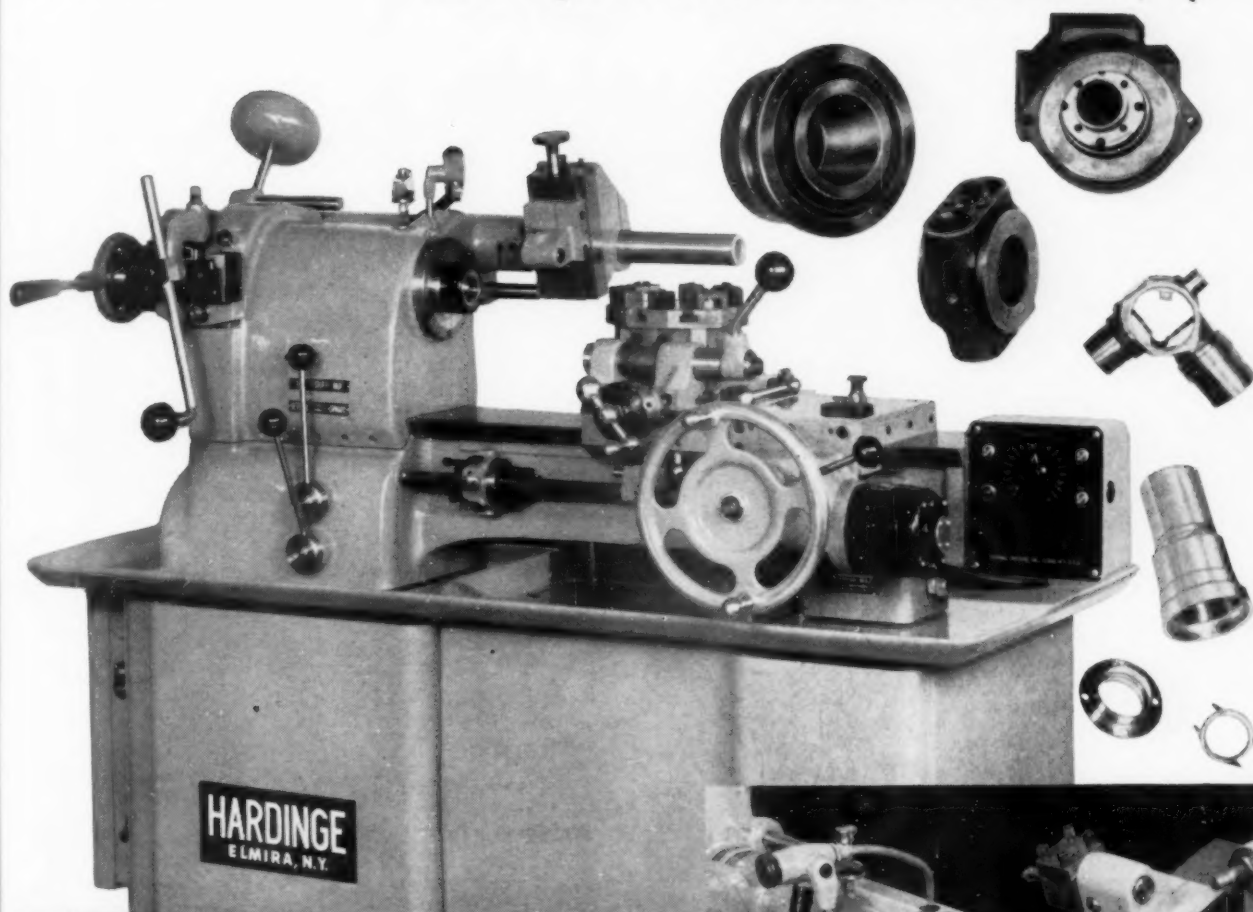
TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

**HARDINGE**  
ELMIRA, N.Y.

## PRECISION CHUCKING MACHINE

*Users say:*

*"We now get Production with Tool Room Accuracy"*



**U**sers enthusiastically tell us how they can easily maintain close tolerances, get better parts finish, and at the same time substantially cut costs . . . when they put Hardinge High Speed Precision Chucking Machines to work.

These results are possible because parts are finished in one setting with simplified tooling. All parts shown were produced with standard tool bits.

1" Collet Capacity—6" Chucking Capacity—  
Write today for Bulletin HC-HCT which presents the whole story.



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PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

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# BALANCED

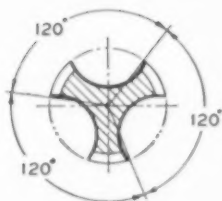


# Action

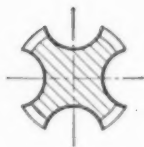
## CAN YOU AFFORD TO USE TAPS THAT DO NOT HAVE IT?

When you consider the many cost-elements that go into production, you'll agree: "It's penny-wise and pound-foolish to compromise with the quality of the tool."

Specify taps with Balanced Action—an inbuilt feature of the Winter line, exclusively—for accuracy and long life.



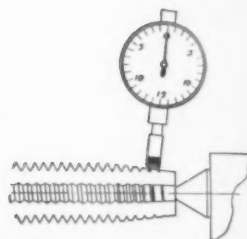
Exact Flute Spacing



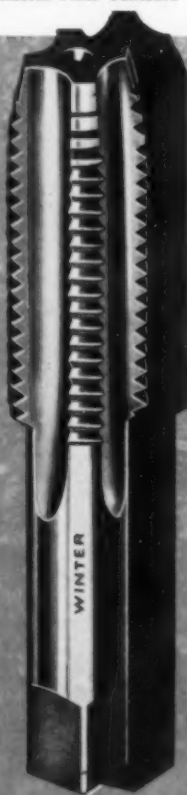
Uniform Flute Contours



Precision Chip Driver Contours



Accurate and Concentric Chamfers



### ALWAYS AT YOUR SERVICE

Your local Industrial Supply Distributor carries a complete stock of WINTER Taps



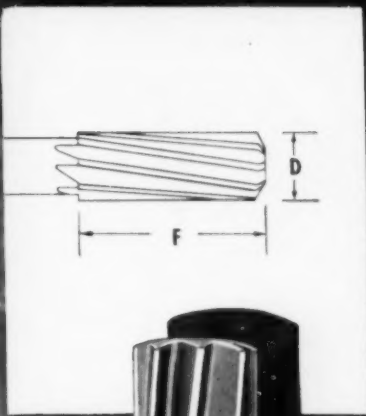
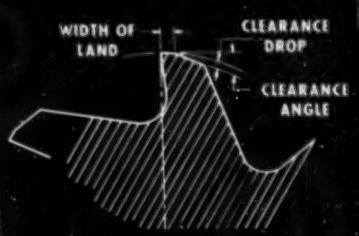
# WINTER

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Rochester, Michigan, U.S.A. Distributors in principal cities. Branches in New York, Detroit, Chicago, Dallas, San Francisco.  
Division of National Twist Drill & Tool Co.



# National



## FOR SMOOTH, ACCURATE HOLES —AND LOTS OF THEM!

National Reamers are ground to very close limits, with National's fine cutting edges. Lands and flutes are carefully proportioned. Materials and heat treatment are the finest . . . Result: smooth, accurate holes—and many, many of them!

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CALL YOUR INDUSTRIAL SUPPLY DISTRIBUTOR  
... for all your staple industrial needs, including NATIONAL  
Twist Drills, Reamers, Counterbores, Milling Cutters, End  
Mills, Hobs, and Special Tools



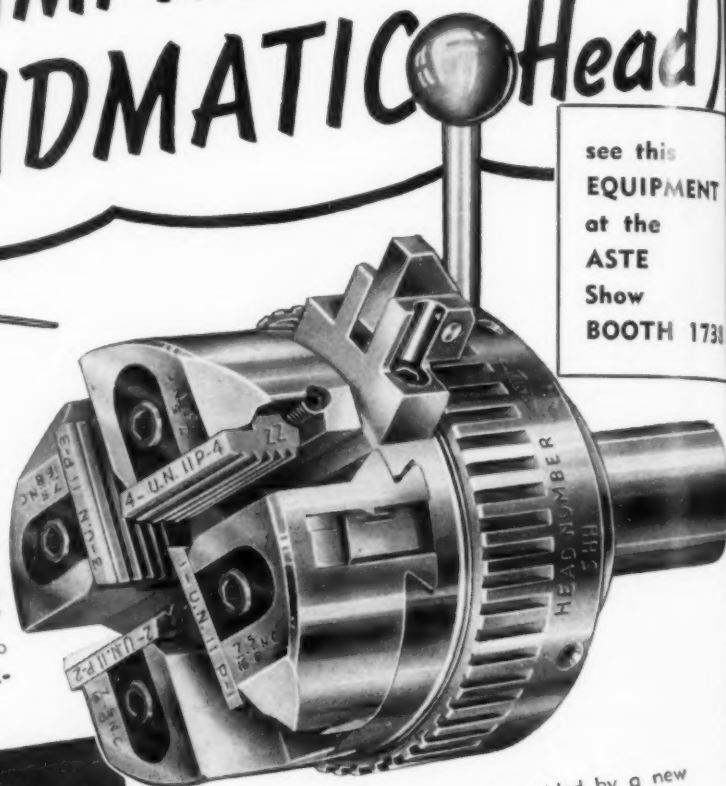


# The IMPROVED $\frac{5}{8}$ " LANDMATIC Head

see this  
EQUIPMENT  
at the  
ASTE  
Show  
BOOTH 1731

- POSITIVE LOCKING ACTION
- MORE RIGID CONSTRUCTION

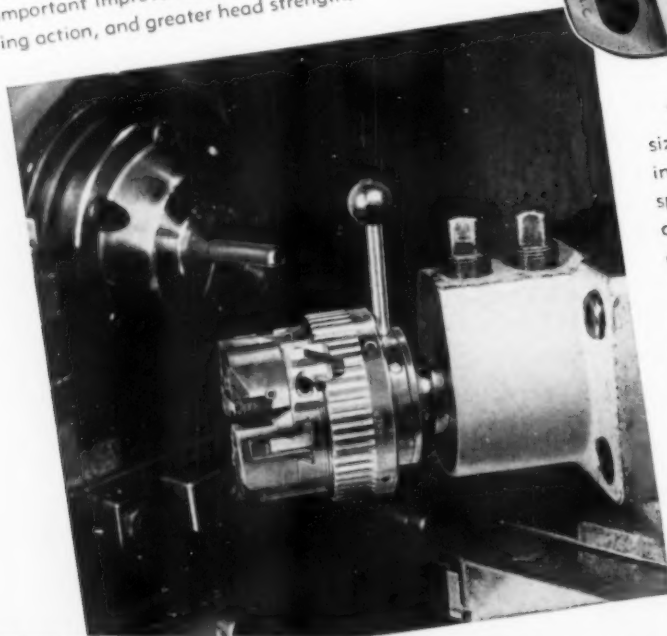
An improved LANDMATIC Hardened and Ground threading head has been designed for use on turret lathes, hand-operated screw machines, and automatic screw machines employing a stationary head. The 5HH LANDMATIC is a stationary self-opening head, and will produce threads ranging from  $\frac{1}{4}$ " head, and will produce threads ranging from  $\frac{1}{4}$ " to  $\frac{5}{8}$ " in diameter. Its construction features two important improvements in design—a positive locking action, and greater head strength.



The positive locking action is provided by a new size-adjustment mechanism. A pivoted latch is held in engagement with notches on the adjustment ring by spring tension. A movement of one notch makes a corresponding adjustment of .001" on the pitch diameter of the workpiece.

The greater overall strength of this die head results from the increased thickness of the head body and its various parts. The new design allows this small die head to easily withstand the extreme stresses imposed when threading special alloy steels.

The 5HH LANDMATIC Head has a notably small number of working parts. All parts are made of special alloy steel, and are hardened and precision ground. Left-hand threads may be cut by using left-hand chaser holders and regrinding the same set of chasers. More information available on request.



## The LANDIS Machine COMPANY

THE WORLD'S LARGEST MANUFACTURERS OF THREAD GENERATING EQUIPMENT

WAYNESBORO • PENNSYLVANIA • U. S. A.

# Starrett

## Satin Chrome\*

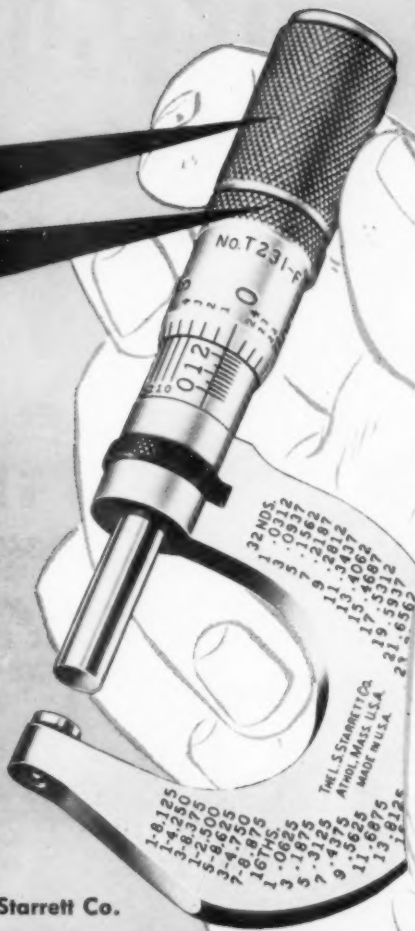
### MICROMETERS

with **FRICION THIMBLE\***  
plus **DIRECT FEEL**

Starrett Friction Thimble Micrometers give you both friction control and direct feel in a micrometer designed for easy, one-hand use. An improved friction control mechanism built into the upper portion of the thimble is "right under your thumb" for fast, accurate repetitive measurements. Lower section of the thimble is integral with the spindle with location and large diameter just right for quick control and "direct feel" on critical measurements.

Only Starrett Micrometers offer you this modern convenience plus 12 other big features. Get them all by insisting on STARRETT Micrometers. Your industrial distributor will give you prompt, dependable, quality service.

\*Pioneered and Developed by The L. S. Starrett Co.



STARRETT  
Micrometer  
No. 231-F

Range 0-1" by .0001"  
Friction Thimbles also available  
in other sizes and styles

## ONLY Starrett HAS THESE 12 BIG FEATURES

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Dept. E, Athol, Mass., U. S. A.



Please send Catalog 26A containing New Tools section plus 300 page display of the complete line of Starrett precision tools, dial indicators, steel tapes, hacksaws, band saws, band knives and precision ground die and flat stock.

Name.....Position.....  
Company.....  
Address.....  
City.....Zone.....State.....

- ONE-PIECE SPINDLE** — Extra rigid integral construction for long, accurate life.
- REPLACEABLE, ADJUSTABLE SLEEVE** — Can be replaced if damaged or worn.
- EXTRA HARD THREADS** — Special high carbon steel gives harder threads which are hardened, stabilized and ground from the solid.
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- NO-GLARE SATIN CHROME FINISH** — On thimble and sleeve of all micrometers, also on frame of all full finish micrometers. No glare, no squint, no eye strain. Resists stains, corrosion and wear.
- TAPERED FRAME** — Permits measurements in narrow slots and tight places. Standard on all full finish outside micrometers.

- RIGID, ONE-PIECE FRAME** — Barrel is integral with frame for maximum rigidity, accuracy and long life.
- EASY TO READ** — Large diameter thimble and sleeve with distinct black figures and graduations against satin chrome finish. Easy to read under any illumination.
- QUICK READING FIGURES** — Every graduation numbered for quick, positive identification.
- CONVENIENT DECIMAL EQUIVALENTS** — of 8ths, 16ths, 32nds and 64ths on frame or thimble of all micrometers.
- QUICK, EASY ADJUSTMENT** — Only two simple adjustments maintain Starrett accuracy.
- LOCK NUT** — Permits locking of spindle at any reading. Available at slight additional cost.

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"WORLD'S GREATEST TOOLMAKERS"



MECHANICS' HAND MEASURING  
TOOLS AND PRECISION INSTRUMENTS • DIAL INDICATORS • STEEL TAPES  
PRECISION GROUND FLAT STOCK • HACKSAWS, BAND SAWS and BAND KNIVES  
THE L. S. STARRETT COMPANY, ATHOL, MASSACHUSETTS, U. S. A.

OUR 30th YEAR IN CARBIDE . . . 1923-1953

# THE WESSON MAN IN YOUR AREA IS AN



**TOOL ENGINEER  
TRAINED IN CARBIDE!**

*He will carry your  
carbide tooling problems  
from part prints to production*



**ON JOBS  
LIKE THIS  
HE GETS  
RESULTS  
LIKE  
THIS**

Pieces Per Grind . . . . . 166  
Tool Cost Per Piece . . . \$0.0716  
Grinding Hours Per Year . . 420

Pieces Per Grind . . . . . 400  
Tool Cost Per Piece . . . \$0.0285  
Grinding Hours Per Year . . 183

**ON 1 JOB WITH 1 WESSON TOOL SAVINGS OF OVER \$240000 PER YEAR**

**See "This Carbide Age"**

Wesson's new color and sound educational film on the story of carbide.

**Write Today**

for literature or call your Wesson Tool Engineer.

**COMPLETE PRODUCTION STORY  
ON THE CATERPILLAR  
TRACK ROLLER SHAFT**

Machine	Fay automatic lathe
Part Machined	Track roller shaft
Operation	Milling and centering
Material	1046 steel
Tools	6 1/4" dia. Wesson Rigidcut Milling Cutter—18 blades
Speed	320 S.F.M.
Depth of Cut	3/4" to 7/8"
Feed	15" per min.
Feed per Tooth	.005"
Feed on Center Drill	.006"
Production	400 pcs. per grind; 50 pcs. per hour
Grade of Carbide	Wessonmetal WH

## WESSON COMPANY

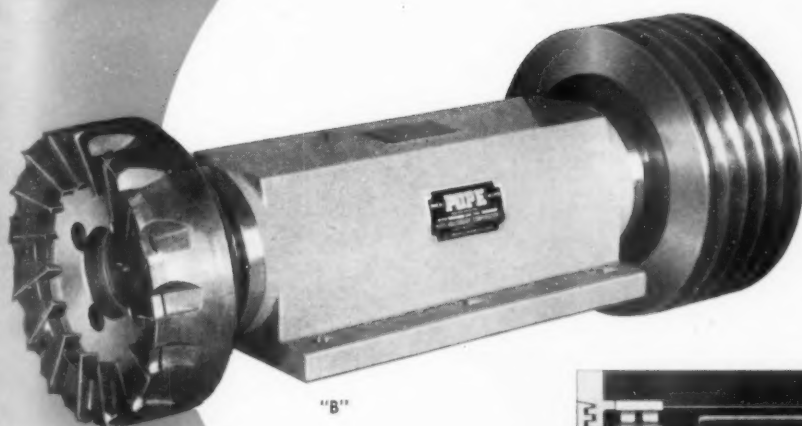
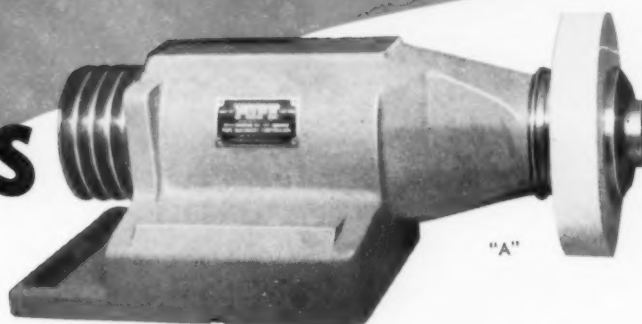
1220 WOODWARD HEIGHTS BLVD.

FERNDAL (DETROIT 20) MICHIGAN

Affiliated with WESSON METAL CORPORATION, Lexington, Kentucky

# *Specify* **POPE**

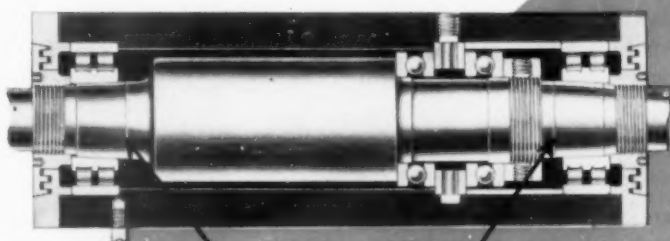
## **HEAVY DUTY WHEEL HEADS**



Note the big precision bearings and the big shaft.

A pair of precision thrust bearings stabilize the shaft against any axial movement in either direction. (No end play)

The double row cylindrical roller bearings carry the radial loads with ease and at low temperature.



Send us your specifications and ask for quotations.

Taper mounting provides for precise individual preloading of the radial bearings.

POPE Heavy Duty Wheel-Head Spindles are designed for a wide variety of applications such as grinding, boring, milling, drilling and many other operations requiring **PRECISION COMBINED WITH RUGGEDNESS** in the spindles.

For continuous production and trouble-free operation **THERE'S NOTHING LIKE A POPE SPINDLE WITH ROLLER BEARINGS.**

No. 94

*Specify* **POPE**  
PRECISION SPINDLES

**POPE MACHINERY CORPORATION**  
Established 1920  
261 RIVER STREET • HAVERHILL, MASSACHUSETTS



*plus 3  
minus 7*

## **A Profitable Investment for any plant!**

The world-renowned Otis Elevator Company recently installed three "AMERICAN" Duplicator Lathes which replaced seven engine lathes.

Such savings are the rule—not the exception—when "AMERICAN" Duplicators are put on the job.

These machines are performing "miracles" in savings in many of the largest and best known units of the metal working industry. They have introduced a new machining technique that has revolutionized the art of turning metal.

They reproduce work shapes from a template faithfully and accurately. They reproduce steps, tapers, right angle and tapered shoulders, recesses, grinding necks and radii, and are especially productive on such work as spindles, motor shafts, valve stems, back shafts, piston rods, axles and a wide variety of chucking work having irregular contours.

More and more the necessity of reducing manufacturing costs is crystallizing in the minds of management. The

attention of directors, top officials and especially production executives is being focused to an increasingly greater degree upon cost-cutting equipment. It is inevitable, therefore, that the "AMERICAN" Hydraulic Duplicating Lathe should command the spotlight. Evidence from a hundred installations proves beyond a shadow of a doubt their leadership as top flight cost reducers.

If it's proof you want just drop us a line—no obligation.



**THE AMERICAN TOOL WORKS CO.**

**Cincinnati, Ohio U.S.A.**

*Lathes and Radial Drills*

**OUT OF  
THIS  
WORLD...**

*American's* **DRILL JIG BUSHING**  
**WESTINGHOUSE ROBOT "ELEKTRO"**

American has established a new standard for service, reliability and quality for drilljig bushings. Their KING SIZE selection of A.S.A. and American Standard types of sizes, and the original 3-D simplified method of ordering from exclusive distributors everywhere, are OUT OF THIS WORLD!

Look for us at the A.S.T.E. Industrial Exposition and see the amazing Westinghouse Robot "ELEKTRO" in American's Booth.

*American*  
**EXHIBIT BOOTH #1234**

We invite you to come in and see the amazing Robot Show in our auditorium at the A.S.T.E. Industrial Exposition, Philadelphia, April 26-30, 1954.

**AMERICAN DRILL BUSHING CO.**

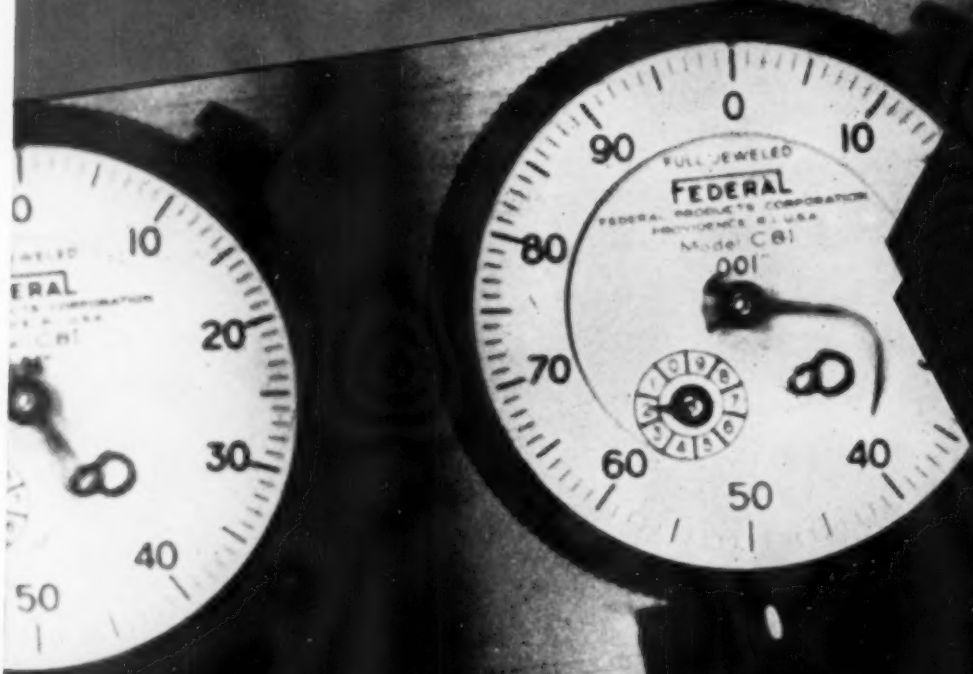
5107 PACIFIC BLVD. - LOS ANGELES 58, CALIF.

FEATURING THE ORIGINAL



SIMPLIFIED METHOD OF ORDERING





What



**THIS  
UNRETOUCHED  
PHOTOGRAPH . . .**

— enlarged from a 16 mm motion picture film taken at 3,000 frames per second during a laboratory test shows the effect of decelerating a Federal Indicator hand at 39,000,000 radians per second from a speed of 90,000 rpm. Momentarily deformed to a hook-like contour, the hand again assumed its normal form after the instrument regained its equilibrium.



# this test means to you!

## PROBABLY YOU'VE NEVER STOPPED TO THINK HOW IMPORTANT AN INDICATOR HAND CAN BE...

IT IS NOT JUST CONVENTIONAL MODERN DESIGN that makes the hand on a Federal Dial Indicator look as it does!

This high-speed movie shows one of thousands of tests made in our laboratory in a constant effort TO PRODUCE THE FINEST POSSIBLE DIAL INDICATORS FOR YOU. In this destructive test the hand has been momentarily deformed by an excessive blow on the Indicator's contact point.

You naturally ask why we don't just make a stiffer hand. The answer is that a *heavier* hand would increase the inertia and friction within the Indicator and decrease its sensitivity and accuracy. A *lighter* hand would have less inertia but it would not recover its normal straightness after extreme operating conditions. The hand of a Federal Dial Indicator MAINTAINS ITS NORMAL SHAPE.

Furthermore, the hand on a Federal Dial Indicator IS STATICALLY BALANCED to assure a CONSISTENT GAGING PRESSURE against the workpiece. You get a more sensitive Indicator of GREATER REPETITIVE ACCURACY.

This kind of detailed research is typical of the great care that goes into the design and improvement of Federal Dial Indicators and helps to explain WHY FEDERAL IS THE WORLD'S LEADING MANUFACTURER OF DIAL INDICATORS.

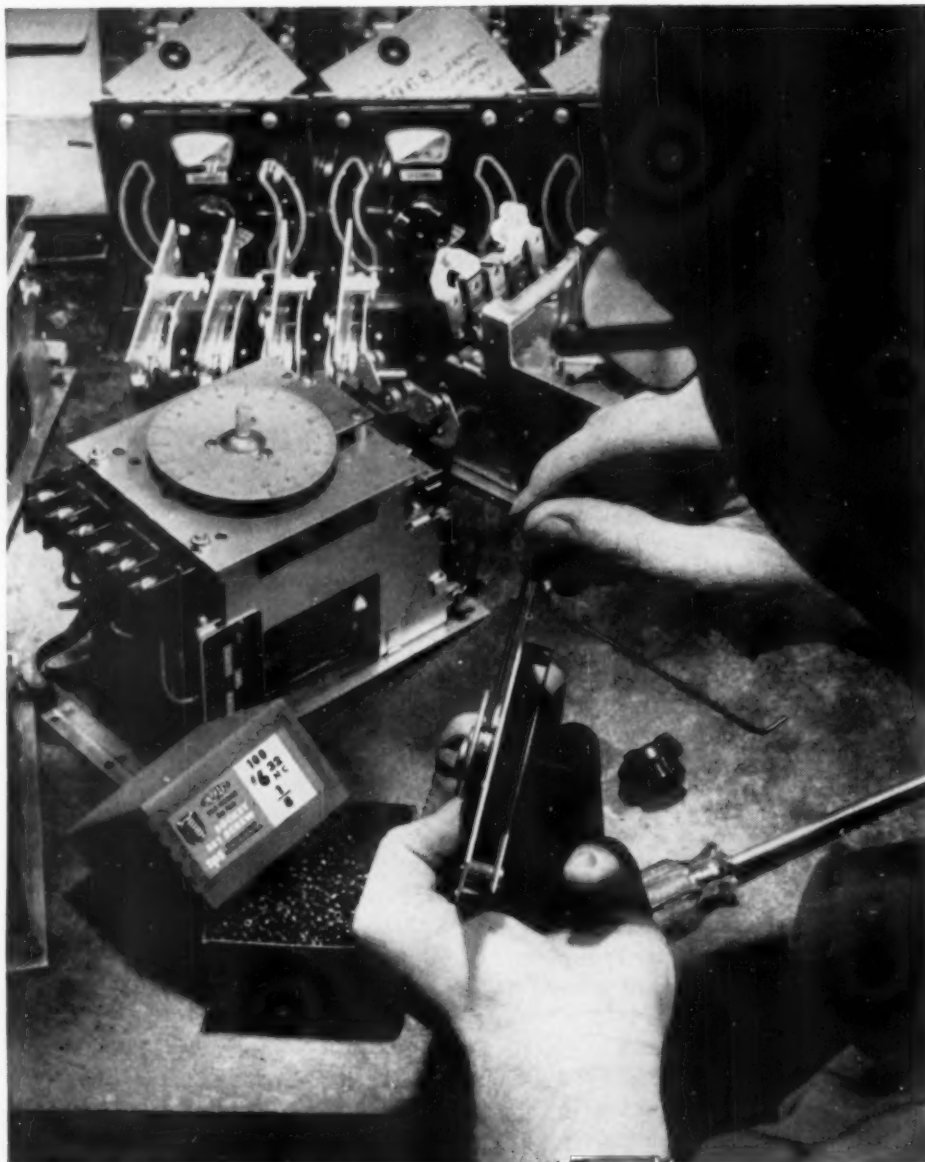
It is also very much worth noting that modern manufacturing techniques and Modern Quality Control have enabled us to sell Federal Dial Indicators AT THE SAME LOW PRICE FOR FIFTEEN YEARS. If you haven't our latest catalog showing the most complete line of Dial Indicators of all styles and sizes, write Federal Products Corporation, 1193 Eddy Street, Providence 1, Rhode Island.

# FEDERAL



Visit Booths 315-321

Largest manufacturer devoted exclusively to designing and manufacturing all types of DIMENSIONAL INDICATING GAGES



UNBRAKO Self-Locking Socket Set Screws are used to hold the Vernier-Set or Cycle-Progress cam on the shaft of this precision timing device. Once they are tightened, they maintain the accurate setting so important to the operation of the instrument.

## You can lower your inventory by using UNBRAKO Standards—stocked by your distributor

You'll have less money tied up in inventory, you'll get personalized service, faster deliveries. In addition, you'll reduce assembly time and increase production with these precision industrial threaded fasteners. Write for UNBRAKO Standards—a complete listing of socket screw products made by SPS and stocked by your local distributor. STANDARD PRESSED STEEL CO., Jenkintown 37, Pa.



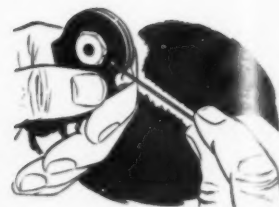
SOCKET SCREW DIVISION

**SPS**

JENKINTOWN PENNSYLVANIA



Flat Head Cap Screw Shoulder Screw Knurled Head Cap Screw Dowel Pin Button Head Socket Screw



Because they are so tiny, the UNBRAKO set screws are picked up and started in the tapped hole with the long arm key.



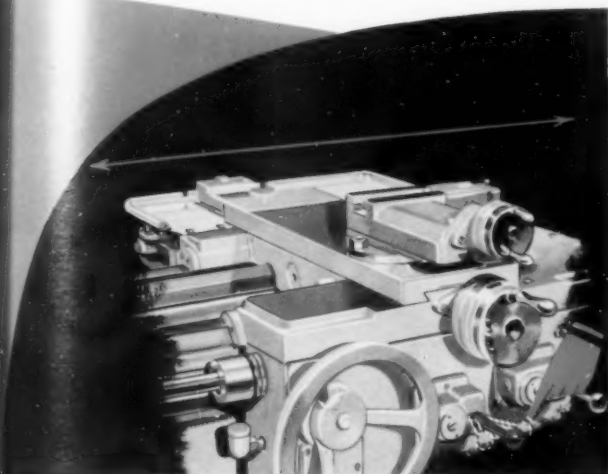
The compactness of the design of the timing device makes it necessary to turn the screw in prior to assembly. The uniform depth and size of the hex socket permit maximum torquing, speed assembly.



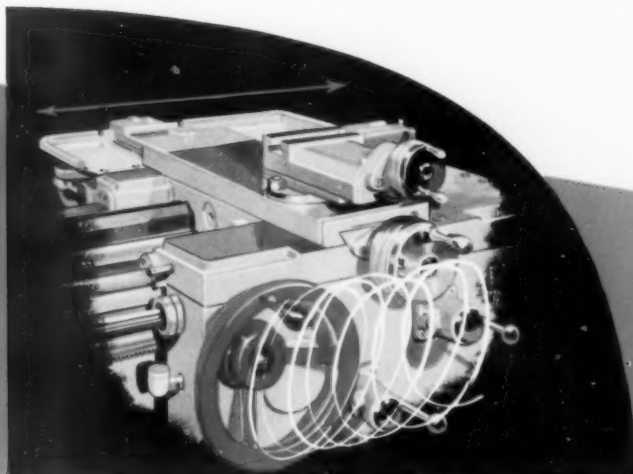
UNBRAKOS—made of heat treated alloy steel—have fully formed threads, Class 3 fit; have knurled cup point for positive locking. Are available in standard sizes from #4 to 1".

# LOOK—NO APRON STRINGS

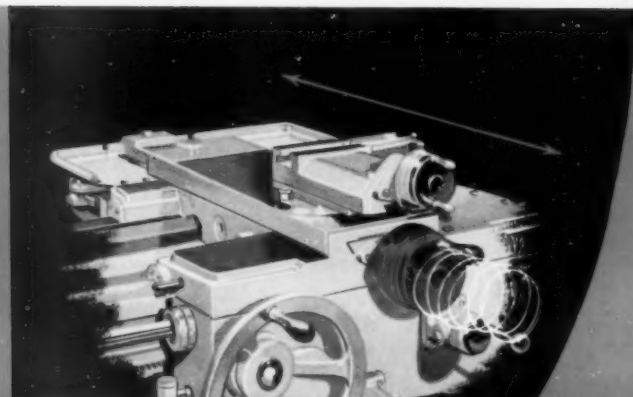
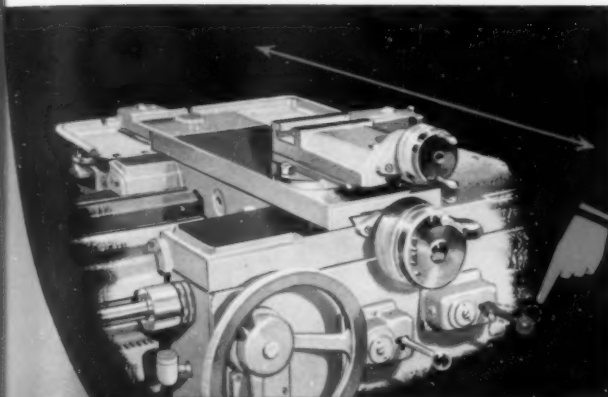
to tie lathe production down



**THIS!**



**NOT THIS!**



**CUT TOOL ADJUST TIME**

**50%**

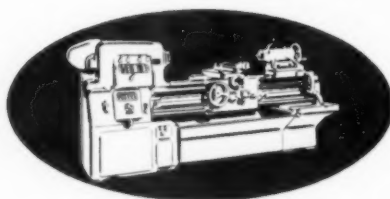
... Why tie Production down—when with just 2  
Fingertip Apron Feed Levers, you can get Rapid Tool  
Positioning—Quick Tool Retraction—Fast Carriage Re-  
turn—Improved Operating Ease—Greater Productivity.

SEE  
next 3 pages  
for details of  
the great new  
MONARCH  
Series 61  
Lathes.

**ANOTHER FIRST FROM MONARCH MACHINE TOOL COMPANY**

# FASTER PRODUCTION

## The Great NEW Monarch Series 61 Lathe—with Fingertip 4-Way Power Rapid Traverse



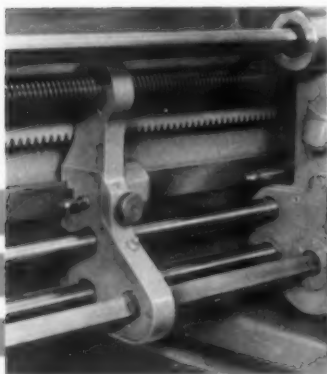
Here's a lathe to warm an operator's heart. And why not? He expends much less effort; yet produces more. The Series 61 is a machine he goes for . . . in a big way.

Monarch has scored another FIRST by putting all tool movements under power, right at the apron. This indeed is the control center of the machine. Close to it the operator spends 90 to 95% of his time. Nothing could be more logical than making it possible for him to do a better job easier at this critical position.

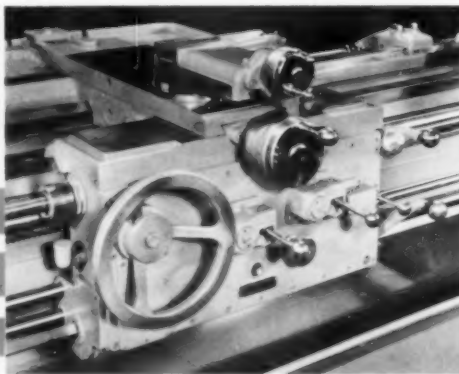
In addition to the Series 61 four-way power rapid traverse which slashes tool adjust time 50%, this machine includes such typical Monarch production features as (1) totally enclosed gear

box and end gearing, (2) automatic pressure lubrication, (3) anti-friction bearings by the score, (4) ground or shaved helical gears in headstock, (5) American standard Camlock spindle nose, (6) flame hardened and precision ground integral bed ways and (7) all critical parts made of hardened alloy steel.

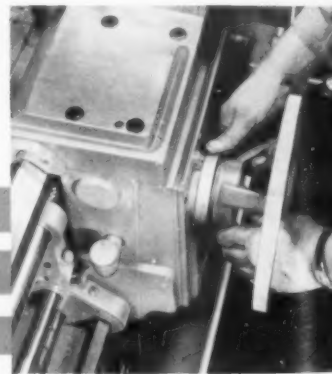
The foregoing numbered features are time-proved in the field, having won their spurs on other models of Monarch lathes. They are your guarantee that the Series 61 lathes are unequaled for accuracy, versatility and dependability. Want more information? Send the coupon (second page following) for our complete Series 61 Brochure #1124 . . . . . The Monarch Machine Tool Company, Sidney, Ohio



**BRIGHT IDEA!** Long bed Series 61 models boast these unique new traveling rod supports for leadscrew, feed rod, traverse rod and control rod. Without attention on part of operator, they're carried along—then re-positioned—as carriage travels.

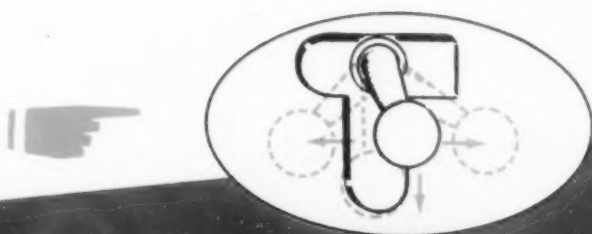


**INSTANT, EASY CONTROL!** Movement of longitudinal friction lever right or left actuates instant rapid traverse in direction of movement. Downward motion engages feed. Cross feed friction lever gives similar action to cross-slide. Quick—easy—a great time-saver.



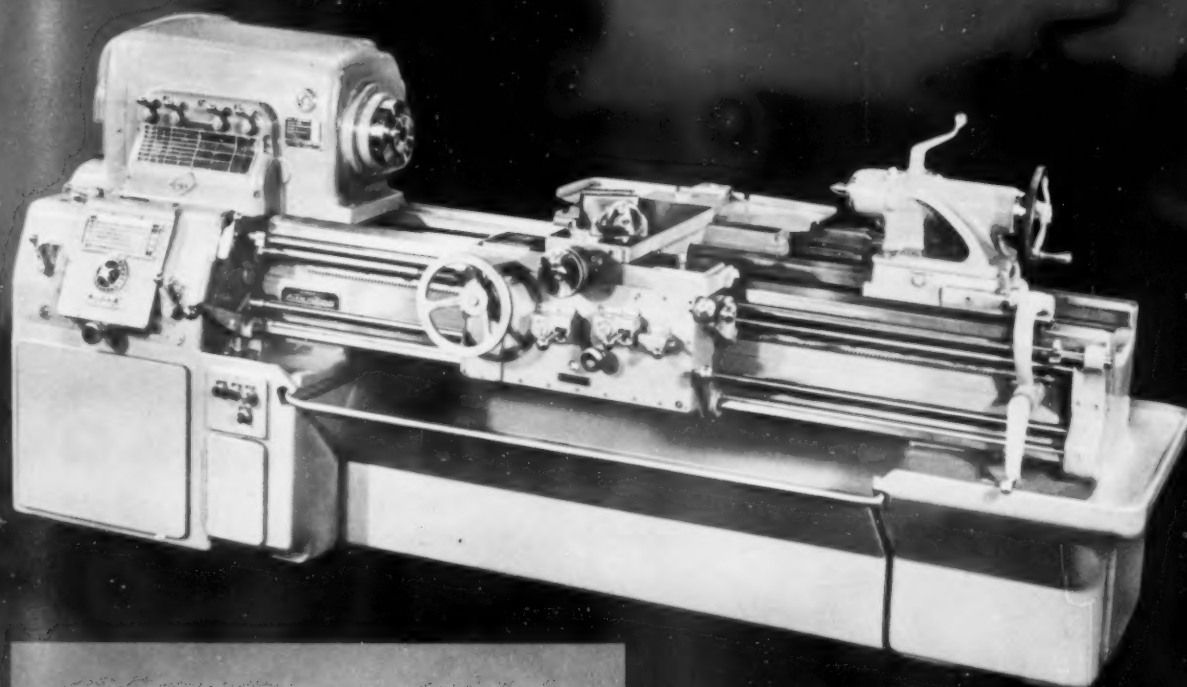
**BUILT-IN DIRECT LENGTH READING DIAL!** Usually furnished as an accessory at extra cost, the direct length reading dial is a built-in feature of the Series 61 and contributes to its accuracy and speed. This feature, used for multiple diameter turning or boring is especially valuable when boring blind holes.

# EASIER OPERATION



CUTS TOOL ADJUST TIME

50%



Monarch 16" Series 61 Lathe . . . representative of the first and only complete line of lathes with inbuilt power rapid traverse. Available in Engine and Toolmaker's Models — 13", 16", 20" and plus-swings in all three sizes.

**Monarch**  
TURNING MACHINES

FOR A GOOD TURN FASTER—TURN TO MONARCH

Continued on next page →

Continued from preceding page

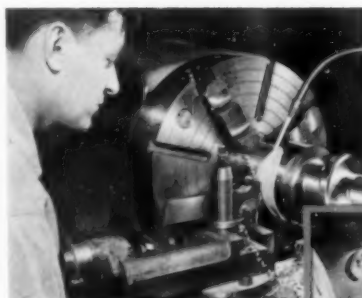
# 50%

# LESS TOOL ADJUST TIME

## A BIG SAVINGS ON JOBS LIKE THESE

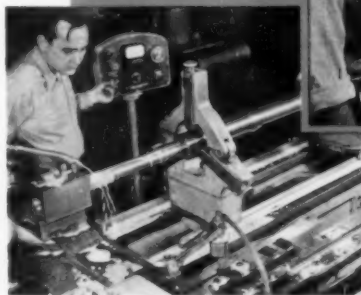
The more intricate the job, the more you save with the four-way power rapid traverse of the new Monarch Series 61 Lathes (see preceding pages). With a two-way longitudinal movement of 160" per minute—and a two-way cross movement of 75" per minute—you can see that the more tool adjust time needed for jobs on older lathes, the greater the savings on floor-to-floor time on the Series 61.

For further time-saving on both small lot runs and high production work, the Series 61 can be equipped with any one of 3 Monarch tracer controls—the Air-Gage Tracer, Monarch-Keller and Motor-Trace. Here's a machine with possibilities no lathe user can afford to ignore. Send coupon today for your copy of our Series 61 Brochure #1124.



**TURNING**

**FACING**



**BORING**



**THE MONARCH MACHINE TOOL COMPANY, Sidney, Ohio**

Gentlemen:

Please send me without obligation your complete illustrated Series 61 Brochure #1124

NAME \_\_\_\_\_ TITLE \_\_\_\_\_

COMPANY \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_

TOOLMAKER'S LATHES — 10" to 20"

ENGINE LATHES — 10" to 32"

THE MONA-MATIC  
for high production metal turning

THE SPEEDI-MATIC  
a fast, precision hand screw machine

THE MONARCH MOTOR-TRACE

THE MONARCH-KELLER TURNING MACHINE

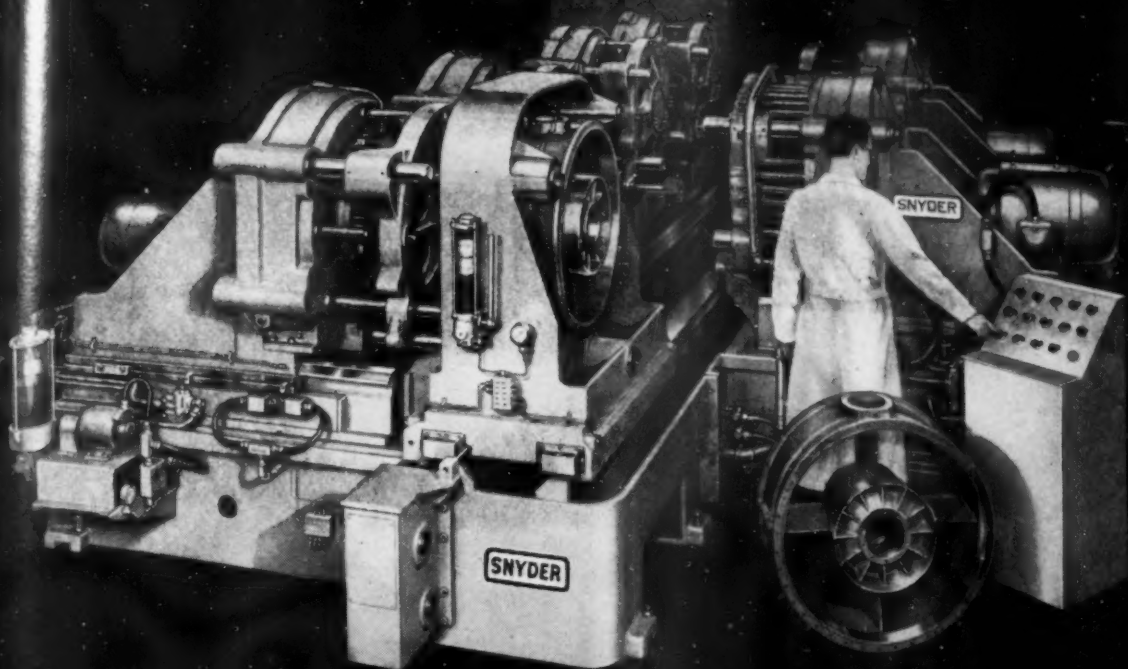
THE MONARCH AIR-GAGE TRACER

THE MONARCH ROLL TURNING LATHES

THE SHAPEMASTER ENGRAVER

SPECIAL TURNING MACHINES





# SNYDER SPECIAL

4-STATION, AUTOMATIC LINE INDEX

MACHINE DRILLS, REAMS, CHAMFERS

420 HOLES AN HOUR IN SIX LARGE

CAST ALUMINUM AIRCRAFT PARTS

AT 80% EFFICIENCY.

# SNYDER

TOOL & ENGINEERING COMPANY  
3400 E. Lafayette, Detroit 7, Michigan

*29 Years of Successful Cooperation  
with Leading American Industries*

*Manhattan Diamond Wheels—More use per dollar*

*Manhattan Diamond Wheels—More use per dollar*

*Manhattan Diamond Wheels—More use per dollar*

*Manhattan Diamond Wheels—More use per dollar*

*Manhattan Diamond Wheels—More use per dollar*

**FOR ECONOMY AND PRECISION . . .** specify Manhattan Diamond Wheels . . . and see why Manhattan leads the field. For carbide, quartz, synthetic sapphire, and soft or hardened steel . . . for internal, surface, and cylindrical operations, Manhattan Diamond Wheels give you the fastest, coolest cutting. One reason—Manhattan's special resin bond which resists loading or glazing when used against carbide tipped tools with steel shanks . . . makes dressing or lapping unnecessary. When you specify Manhattan Diamond Wheels, you are buying **MORE USE PER DOLLAR . . .** lowering costs . . . building profit.



**WRITE TO DIAMOND WHEEL DEPARTMENT**



**MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY**  
**RAYBESTOS-MANHATTAN, INC.**



Flat Belts



V-Belts



Conveyor Belts



Hose



Roll Covering

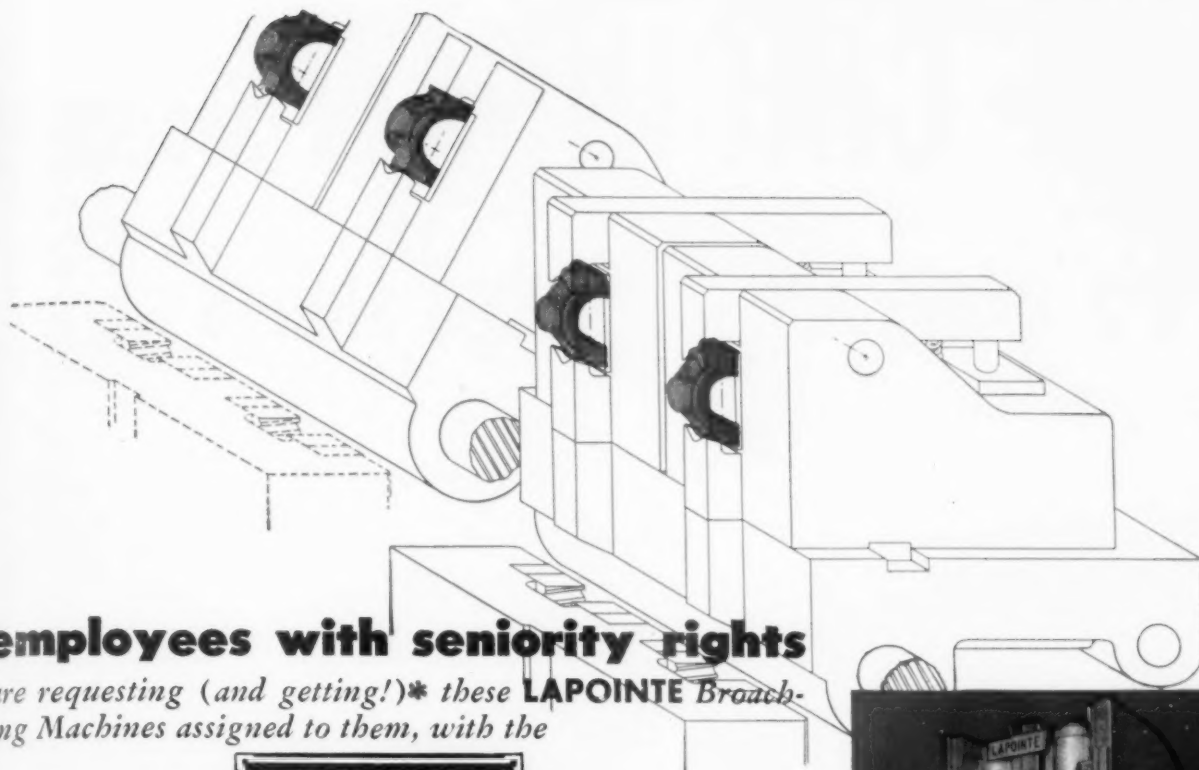


Tank Lining



Abrasive Wheels

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings  
 Asbestos Textiles • Teflon Products • Packings • Sintered Metal Parts • Bowling Balls



**employees with seniority rights**  
are requesting (and getting!)\* these **LAPOINTE** Broaching Machines assigned to them, with the

exclusive

**LAPOINTE**

**DOUBLE TIP-DOWN FIXTURE**

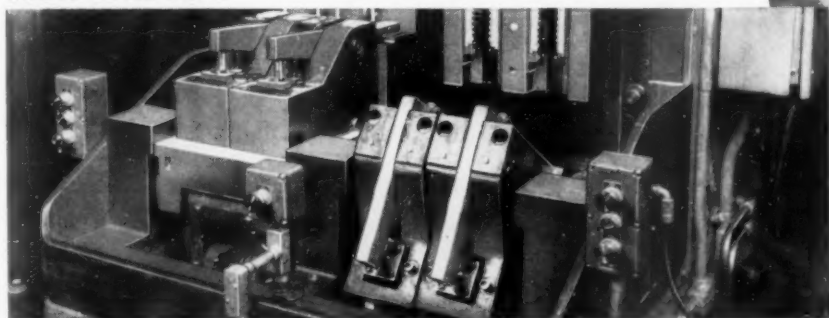
**why?**

*Because they have found these machines so convenient for part handling!*

Here are the reasons: *Fixture tilts down toward the operator*

- ... for safe and convenient handling of parts
- ... in the most natural position
- ... into inclined, unobstructed work nests
- ... already visible and easily accessible without reaching across the machine!

Write for Bulletin DRV-5



The **LAPOINTE** Double Tip-Down Fixture operates hydraulically and is electrically interlocked in synchronism with the travel of the broach assemblies, cutting on one ram while the other ram is being loaded.

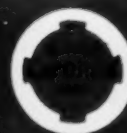
Straddle broaching the sides of **Automotive Connecting Rod Cap**, removing a maximum of  $\frac{1}{8}$ " of stock per surface from the forging ... with the **LAPOINTE** 10-ton, 42-inch stroke Double Ram Vertical Surface Broaching Machine. With this machine, even a green operator who had never before run a machine was able to produce 750 parts per hour!

\*An actual case! (Name on request.)

**THE LAPOINTE**

**MACHINE TOOL COMPANY**

HUDSON, MASSACHUSETTS • U. S. A.  
In England: Wulford, Hertfordshire



THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

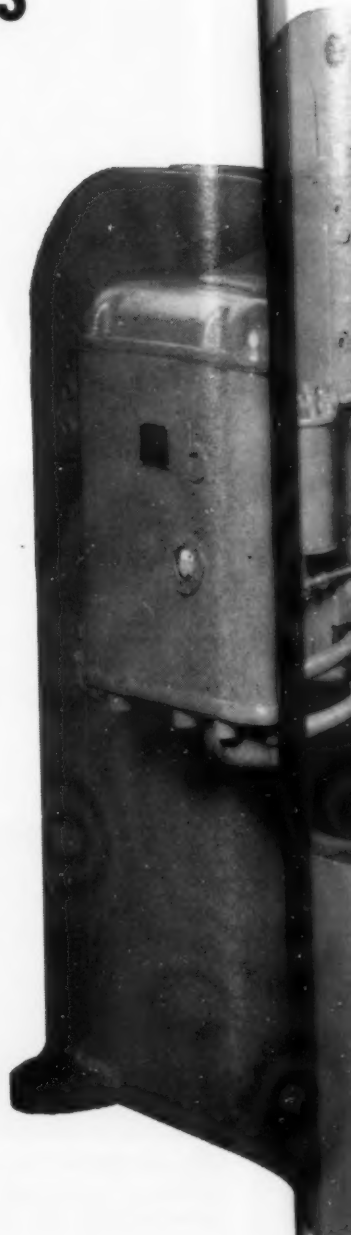
# CINCINNATI accurately sh

1/2" plate and 20 gauge sheets

**...without  
changing  
knife  
clearance**

... You do not change knife clearance for successful shearing of different thicknesses on a Cincinnati. Just set the clearance for the thinnest material and shear all thicknesses up to capacity. Thousands of Cincinnati Shears are used continuously in this manner. This practical method prevents accidental damage — saves time. Remember, changing knife clearance interrupts production.

Investigate the Cincinnati All Steel Shear and its accurate, time-saving features, developed thru years of experience.

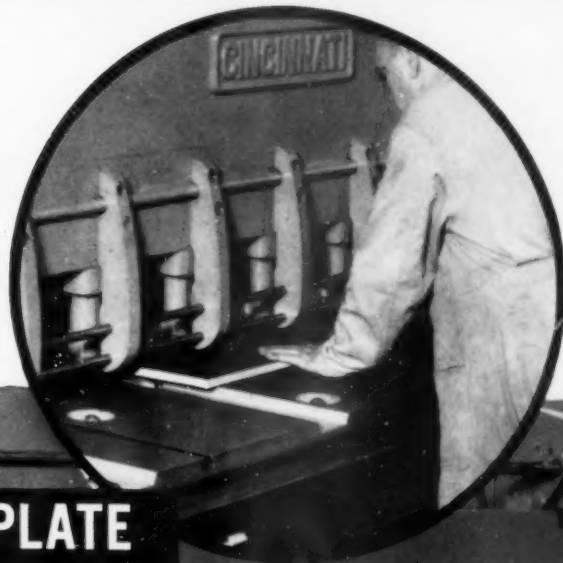


## THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A.

SHAPERS • SHEARS • BRAKES

ly shears



**1/2" PLATE**

**OR**

**20 GAUGE**



*Write for Catalog S-6...  
describing Cincinnati Shears*

# ***He scores highest cutting-tool "quiz"***

## ***...your Morse-Franchised Distributor!***

No matter who brings up the tough questions on cutting-tool applications, your Morse-Franchised Distributor has the *right* and *ready* answers. Plus the hard-earned practical experience to go out in your plant with your men and prove the soundness of his recommendations.

Yes, he helps you to get the most for your money out of the finest and most complete line of cutting tools that money can make . . . *the Morse Line of Drills, Taps, Dies, End Mills, Counterbores and Cutters.* So when *you* need the right answers *right now* to a tough problem in cutting tool application, call your Morse-Franchised Distributor. He'll guide you right and save you money . . . *every time.*

### **MORSE TWIST DRILL & MACHINE COMPANY**

**NEW BEDFORD, MASSACHUSETTS**

*(Division of VAN NORMAN CO.)*

*Warehouses in New York, Chicago, Detroit,  
Houston, San Francisco*



on any  
program"



MORSE

**Cutting Tools**

*Buy them by phone  
from your Morse-Franchised  
Distributor and save  
ordering time*



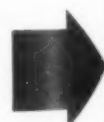
**CUTTING.** New S.E.C.O. keeps parts and tools cooler. Tools last longer, require fewer grindings; production is increased; finishes are uniformly good.

***Now Better Than Ever!***

# **Sunoco Emulsifying Cutting Oil**

**New refining facilities improve industry's most widely used cutting oil and permit it to give these added benefits**

- **HIGHER MACHINING EFFICIENCY**—better finishes, longer tool life, increased production in cutting operations
- **INCREASED DETERGENCY**—particularly important in grinding operations—provides better surface finishes, prevents loading and glazing of the wheel, prolongs wheel life
- **BETTER MIXING QUALITIES**—in hot, cold or hard water
- **A PURER, CLEANER CUTTING OIL**—whiter, more stable emulsions; cleaner parts and machines; better operator acceptance
- **EASIER HANDLING**—pumps from storage tanks more readily, flows from drums faster
- **GREATER VERSATILITY**—can be used for rolling, washing and rustproofing as well as cutting and grinding



EXES BET  
E.C.O. m  
en at 18  
washing

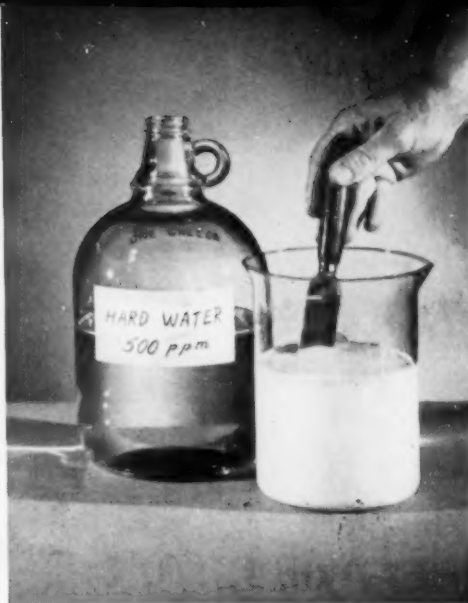
GRINDI  
surface  
deterge  
glazing  
longs v



**MIXES BETTER IN HOT WATER.** New S.E.C.O. mixes and remains stable even at 180 F. This permits its use in washing and rustproofing.



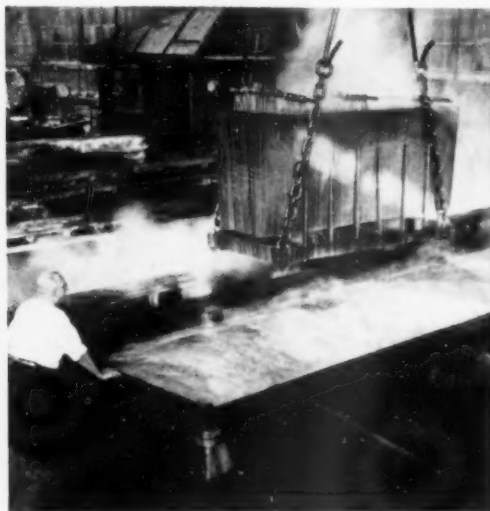
**MIXES EASILY IN COLD WATER.** New S.E.C.O. forms stable emulsions in the coldest water . . . even ice water does not affect it.



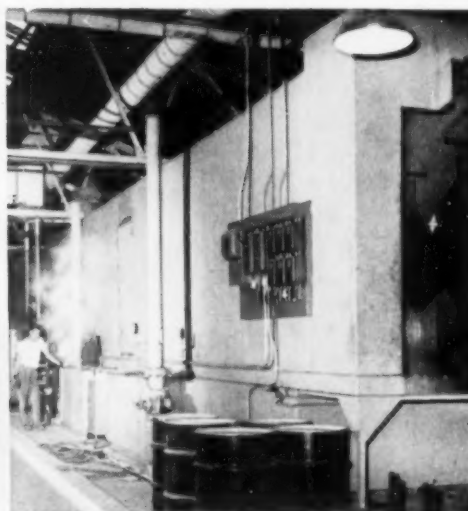
**MIXES READILY IN HARD WATER.** New S.E.C.O. eliminates the need for special hard-water grades of emulsifying cutting oil.



**GRINDING.** New S.E.C.O. improves surface finishes because its increased detergency prevents loading and glazing of grinding wheels, prolongs wheel life.



**RUSTPROOFING.** New S.E.C.O. is a better hot rustproofing medium. It forms stable emulsions, coats metal parts uniformly, protects them against rusting.



**WASHING.** Because of its increased detergency and its ability to mix and remain stable in hot water, New S.E.C.O. is better for removing grease and dirt from metals.

**TEST THIS NEW S.E.C.O. IN YOUR OWN PLANT.** For more information, call your nearest Sun office or write SUN OIL COMPANY, Phila. 3, Pa., Dept. TE-3.

**INDUSTRIAL PRODUCTS DEPARTMENT**  
**SUN OIL COMPANY**

PHILADELPHIA 3, PA. • SUN OIL COMPANY LTD., TORONTO & MONTREAL

Made by the producers of famous Blue Sunoco Gasoline and Dynalube Motor Oils



**NOW! Cut Carbide Costs**

# **NEW!** **Vascoloy-Ramet** **Toolholders\***

*For Triangle...  
Round... Square Inserts*

**"Built-In" Versatile Carbide Chipbreaker  
Eliminates Chipbreaker Grinding...  
Permits Using All the Carbide**

The New V-R Toolholders make it possible, for the first time, to use all of the carbide insert. The superior design "Built-In" carbide chipbreaker of extreme versatility provides correct chip formation over wide cutting range for single chipbreaker width and eliminates expensive chipbreaker grinding. Get full details in the new V-R Toolholder Catalog VR-435.

\*Patent Pending

**DESIGNED AND MANUFACTURED BY**

Versatile Carbide Chipbreaker. More edge life — less heat.

No Chipbreaker grinding.

Uses all the carbide.

## **Cut Carbide**

**V-R Standard Length Inserts 1 1/2" Long**

**STANDARD LENGTH INSERTS GIVE YOU ADDED CARBIDE LENGTH**, when used in the New V-R toolholder. New design gives you up to 84% more utilization of a carbide insert than is possible in any other toolholder. Standard length inserts are still the same, high quality, carbide Vascoloy-Ramet has always produced. Cut your carbide costs by using standard length inserts in the New V-R toolholder.



VASCOLOY-RAMET CORP  
WAUKEGAN, ILLINO  
TBR

One piece alloy  
forging —  
rugged and  
precise.

One screw for  
adjustment,  
location and  
clamping of  
insert.

Tamper-proof.  
Cutting edge  
automatically  
positioned.

Nothing to  
wear out but  
the carbide.

## Inventory By 50% Or More!

### V-R "Half-Length" Inserts 3/4" Long

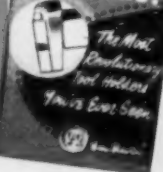
"HALF-LENGTH" INSERTS COST LESS . . . GIVE MAXIMUM CUTTING. V-R toolholders use at least 85% of the carbide of half-length inserts. Machining with half-length inserts in V-R toolholders begins, where machining stops, with standard length inserts in ordinary toolholders. Lower initial cost, greater usage, elimination of chip-breaker grinding results in lower inventory and cutting cost with half-length inserts.

### V-R "Throw-Away" Length Blanks

"THROW-AWAY" BLANKS ELIMINATE GRINDING. Designed to use all cutting edges on both ends without grinding results in the lowest cost per cutting edge obtainable for any insert. Blanks are used and then thrown away. Throw-away blanks are available either as: PRECISION, ground all over to the same tolerances that apply to standard length and New V-R half-length inserts, used where precision indexing is necessary, or desirable. UTILITY, ground on two faces only, used where precision indexing is not necessary.

WRITE FOR  
FREE V-R  
TOOLHOLDER  
CATALOG  
VR-435

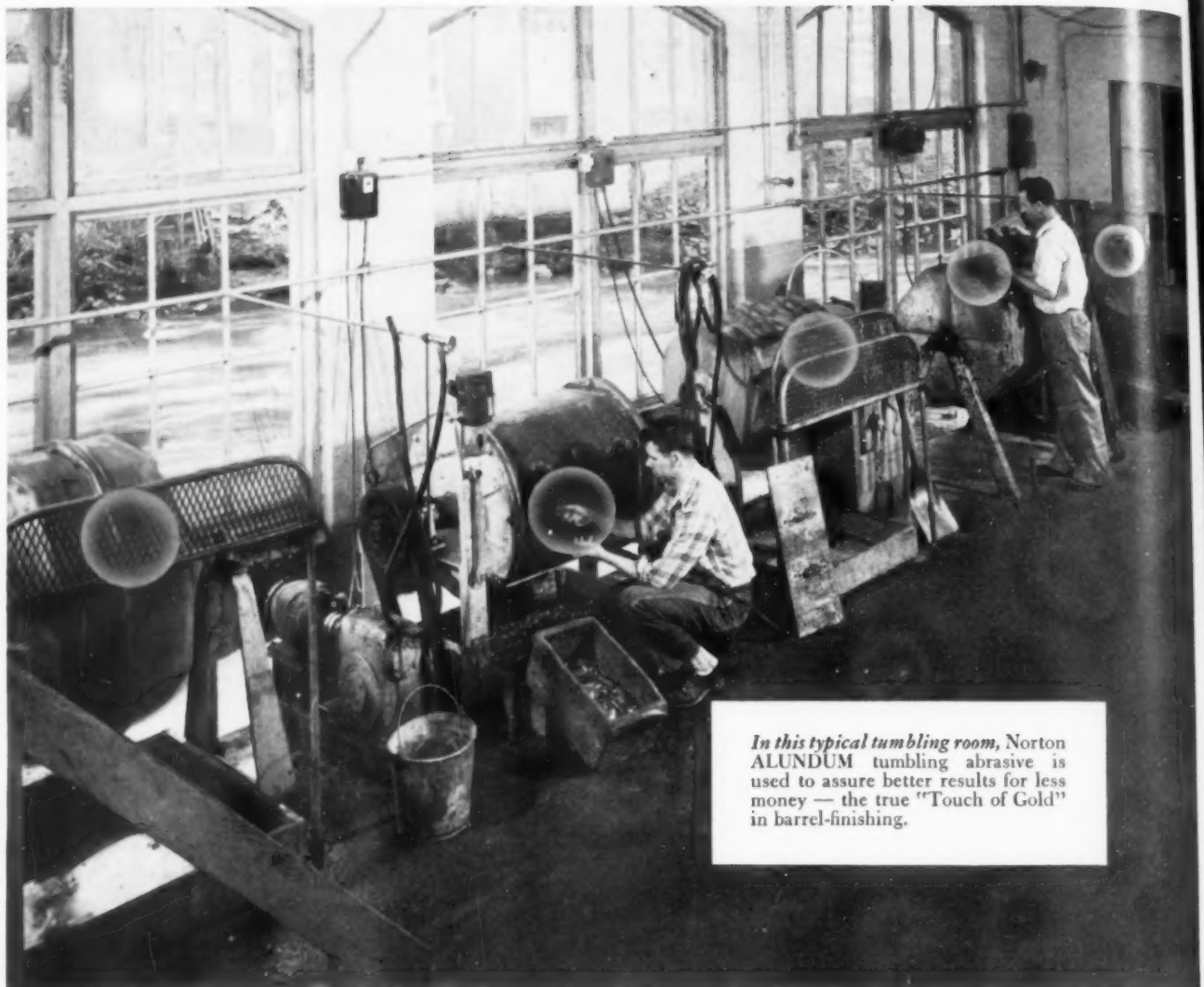
IT'S HERE!



Vascojoy-Ramet Corporation

WAUKEGAN, ILLINOIS

REPRINTED FROM TOOL ENGINEER



*In this typical tumbling room, Norton ALUNDUM tumbling abrasive is used to assure better results for less money — the true "Touch of Gold" in barrel-finishing.*

## Start with ALUNDUM\* tumbling abrasive . . . and you'll finish with the "TOUCH OF GOLD"

Especially developed to eliminate hand finishing of stampings, forgings and castings, Norton ALUNDUM tumbling abrasive is processed to impart a strong, blocky shape to the individual grains, with no sharp projections to mar the work. Here are some of the reasons why barrel-finishing with this tough, hard abrasive is standard in leading plants:

- It provides the fastest, most economical method of finishing metal parts to exact dimensions and surface finishes.
- It removes burrs, flash, tool marks and heat scale from large quantities of parts, saving endless man-hours.
- It eliminates many slow hand-finishing operations, increases production rate of

parts ranging in size from tiny needles to hefty castings.

Learn how ALUNDUM tumbling abrasive can bring you the value-adding, cost-cutting "Touch of Gold" — by giving you constantly better finishing results while helping you shorten tumbling cycles, reduce scrap and reworking. Whether or not you have barrel-finishing, Norton will gladly make test runs for you, to show you what this process with ALUNDUM tumbling abrasive will do for you.

See your Norton Distributor, and ask him for the new edition of the 55-page booklet on barrel-finishing. Or write to NORTON COMPANY, Worcester 6, Mass.

Distributors in all principal cities, listed under "Grinding Wheels" in your classified phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

G-285

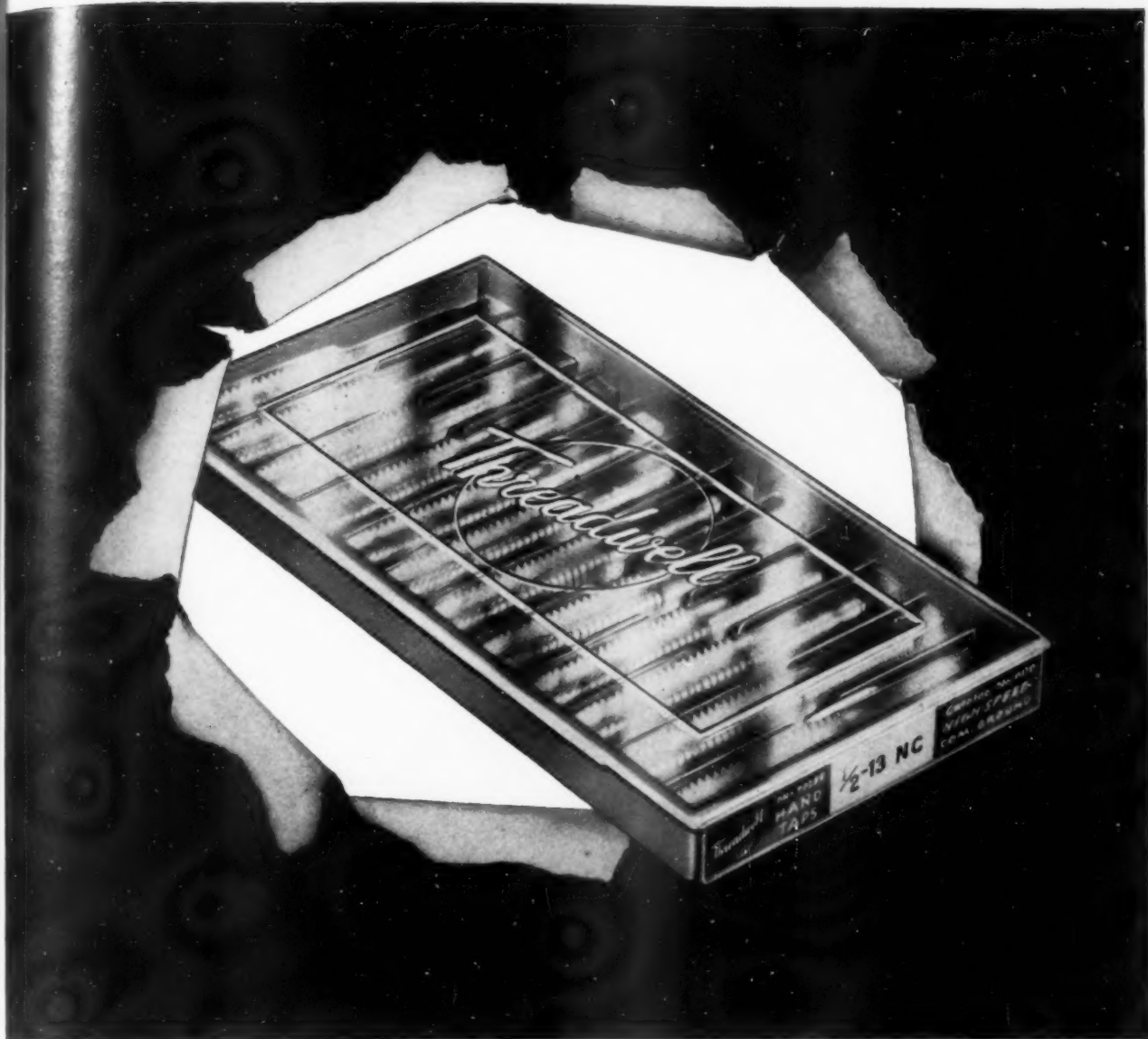
**NORTON**

**ABRASIVES**

*Making better products . . .*

*to make other products better*

\*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries



**NOW Threadwell quality is protected  
in new plastic packages!**

In April Threadwell Distributors will begin to receive Threadwell taps in striking new lifetime plastic packages.

These packages will not only protect the fine quality of Threadwell taps but will also speed up delivery both to the Distributor and the user.

Threadwell is justly proud of the high quality of its products and this new package is one more evidence of our policy to produce the best possible product at the lowest possible price. Our only business is the manufacture of fine cutting tools. We intend to stick to our last . . . first.

see your



distributor

THREADWELL TAP & DIE COMPANY • GREENFIELD, MASS.

March, 1954

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-33

33

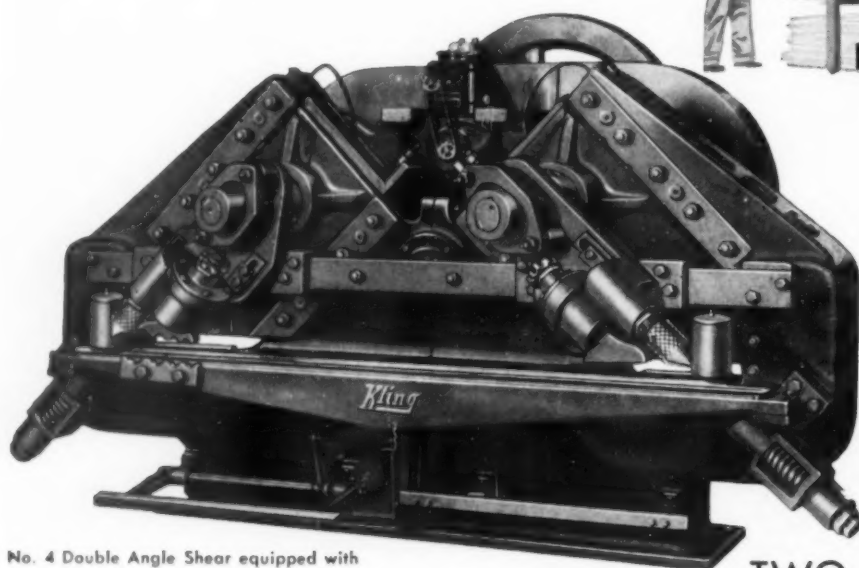
# It's the **BUSIEST** machine in the shop!

... gives more cuts per day on **FLATS**



**ANGLES**

**ROUNDS**



No. 4 Double Angle Shear equipped with Automatic Lubrication System, Gear Guards and Automatic Hold-downs.

**Kling**  
**double**  
**angle**  
**shears**

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If you're using obsolete, slow-poke methods of shearing, the Kling Double Angle Shear can help you save time and money. This modern compact machine is designed for high speed, high production shearing on both long and short run jobs. Many metal fabricating plants and steel warehouses have found the Kling Shear to be the workhorse of the shop. For instance, one machine will shear round bars and bar angles on the left side while the right side can be used for structural angles and flat bars. The machine is built with the speed and power to handle the bulk of your shearing requirements. For shops with considerable mitre shearing

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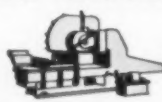
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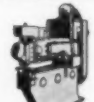
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# The Tool Engineer

## Our Industrial Exposition

Although we have occasional setbacks in the American economy, it seems that our curve is always comfortably upward.

Our biennial expositions have always been bigger and better and the forthcoming show would be still bigger, if more space were available. In fact, the only regret we have this year is that the largest show area on the East Coast is just not big enough, so many of our good friends in industry will be unable to show their technical wares.

We will have the biggest show ever. With competition in all fields developing fast, it is a must to see and hear about the many, many new tooling developments that can help you produce more economically.

Make note, also, of the many technical sessions that will bring the country's outstanding authorities to Philadelphia prepared to show you the "how" of more and better production.

Plan now to attend the 22nd Annual Meeting in Philadelphia—April 26 to 30th. It will be well worth your while.

*R. F. Waindle*

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# Prescription for Prosperity

By Ralph E. Cross\*

Executive Vice President  
The Cross Company  
Detroit, Mich.



Fig. 1. New tools are an important part of a modernization program. This machine mills, drills, reams, chamfers, spot faces and taps two-speed axle differential carriers at the rate of thirty-five an hour.

WHETHER WE FALL into a depression or go forward to an era of great prosperity, will depend entirely on how well we understand the workings of our American production system. Conditions are changing. Our "prophets of gloom" would like to be optimistic but, because they are up against something they don't understand, they are pessimistic.

Many say that our high standard of living is the result of competition. That is only part of the story. Competition is only a force that stirs us to action. It does not tell us what action to take. If it is to be effective it must stir us to action at the right time, and it must make us move in the right direction, otherwise we have stagnation, failure and depression. For example, in the automobile business the force of competition brings about the change to a new model, and everything that goes with it—the new factory, new machine tools, Fig. 1, etc.

Because of competition, automobile men do not wait for the public to get tired of their product. They anticipate the demand and supply the cars that people want and in so doing, they replace the

old with the new. If their decisions are poor or, if they move too fast or too slow, thousands of people are thrown out of work and we have a force that contributes towards recession. If their decisions are just right, prices go down, wages go up, more people are employed, and we have a force in the direction of prosperity. That in a nutshell is the essence of our American production system—competition forcing change, but change in the right direction and at the right time.

Does competition work like this in all industries? Unfortunately, it all too often does not. For example, a prominent industrial executive recently said he would do as much business in 1954 as he did in 1953, but that his profits would be down considerably. Then he went on to say that a German concern had a new machine for making his product that was unbelievable. With one girl operator, it would produce more than he could make with a whole department of people. He felt that he would have to buy some of these machines if he was going to stay in business. He didn't know what the world was coming to, and he didn't know what some people were going to think of next.

Now, would that German firm be in business if this man had given his own engineers a chance to improve his manufacturing methods? As a matter of fact, why didn't he insist that his engineers make satisfactory improvements from year to year. Is

\*Senior member ASTE Detroit chapter.

Mr. Cross has recently been appointed Director of Metalworking Equipment Division, Department of Commerce.  
This article is based on a paper recently presented before the ASTE Greater New York chapter.

he guilty of mismanagement? Yes, because first he should understand what makes his business prosperous, and second he should insist that his organization keeps in top competitive condition.

It is easy to be critical. Management executives deserve to be censured for not knowing their abc's but, in all fairness, it should be pointed out that it is no easy job to keep a business operating at a high level of prosperity. As competition forces change, risks must be taken involving large capital expenditures. These risks, more often than not, mean the difference between success and failure.

A new automobile model, for example, requires an investment of millions, sometimes hundreds of millions, in engineering, buildings, machine tools, market surveys, sales and advertising campaigns, etc. Putting all these elements together in the proper proportions is a complex problem. It is all the more complicated when executives have little if any factual information to guide them. Too much is left to intuition.

Too many good proposals are dropped by the way-side; too many hairbrained schemes are accepted because facts aren't known.

Today, many progressive firms are setting up departments to take the guesswork out of these important management decisions. This work is called modernization analysis or sometimes replacement analysis.

The chart, Fig. 2, graphically illustrates the significance of good modernization timing. It shows



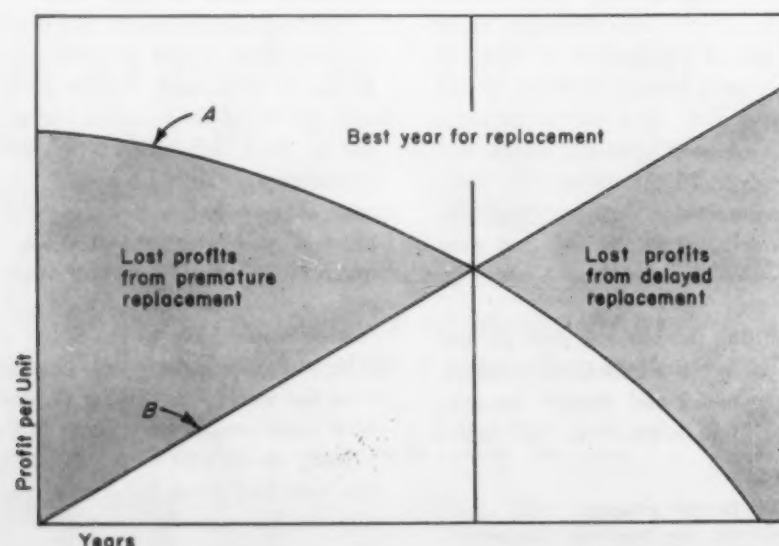
the losses that result from premature modernization as well as delayed modernization. Curve *A* plots the profits of a manufacturing process from the year of installation to the time when it is no longer profitable. The decline is the result of obsolescence. Line *B* plots the profits per unit that might be derived from installing the most up-to-date process available at the beginning of each year. The increase in profits technological progress.

It should be remembered that Process *B* must absorb the loss if the equipment in Process *A* is sold for less than book value. This has a tendency to hold down the profits for *B* in early years while such a loss is being absorbed. Lost profits resulting from premature or delayed modernization are represented by the difference between *A* and *B*. The best year for modernization is the year in which the two lines cross. Considering the advantages of good timing alone, every business needs a man or department devoted to modernization analysis.

How can a modernization program be started? To put modernization on a business-like basis, a company must do two things. First, it must establish a modernization policy and, second, it must develop a procedure to analyze modernization plans. Policy, of course, will vary with different companies, depending on requirements. Nevertheless, every company's policy should include at least a statement of intent to replace or modernize capital equipment as rapidly as it is economically practical, and the in-



Fig. 2. Effects of modernization timing upon profits. Replacing Process *A* prematurely by Process *B* reduces profits. Likewise delayed replacement is costly. Best time for replacement is where the process curves intersect.



PROJECTED PROFIT AND LOSS STATEMENT FOR THREE PLANS OF PRODUCING OIL PUMP BODIES			
Production -- 1,250,000 pieces per year Estimated life of process -- 8 years			
	PLAN 1	PLAN 2	PLAN 3
INVESTMENT REQUIRED	None	1,071,000	850,000
Sales 1,250,000 Bodies @ 0.82 each	1,025,000	1,025,000	1,025,000
Cost of Sales	396,000	396,000	396,000
Material	None	None	None
Subcontracting	127,268	53,328	79,592
Direct Labor	1,500	495	5,139
Rework	7,434	3,638	7,000
Setup & Tool Change	20,250	7,000	18,511
Supervision	43,290	12,892	4,760
Labor Fringes	4,435	5,443	5,100
Floor Space	3,475	6,000	17,000
Power	5,000	21,420	2,975
Taxes	1,791	3,750	20,100
Insurance	27,050	18,750	3,820
Perishable Tools	9,200	3,720	18,300
Supplies	26,060	13,480	9,630
Scrap	13,320	7,750	3,750
Tool Grinding	15,500	5,100	2,500
Machine Repair	3,550	1,250	74,375
Lubrication	None	93,713	11,238
Depreciation	28,090	7,999	681,315
Miscellaneous	793,242	661,728	343,685
Gross Profit	231,787	363,270	66,625
Selling Expense	66,625	66,625	37,472
Administrative Expense	43,627	36,395	None
Interest	None	None	None
Profit Before Tax	121,535	260,252	239,588
Estimate for Federal Income Tax	60,767	130,126	119,794
Net Profit	60,768	130,126	119,794

Fig. 3. Dependable method for analyzing proposed production methods is to project Profit and Loss statements for each.

tent to review all capital equipment for modernization at regular intervals.

Establishing a procedure is more complicated than setting policy, but it need not be difficult. The underlying principle is the selection of one plan, machine or process that will produce the largest profit. The best selection is found by comparing the merits of several different proposed plans of operation over a one-year period. One of the best ways of making comparisons, and one that is readily understood, is by projecting the Profit and Loss statement.



A projected Profit and Loss statement of three plans for producing oil pump bodies is illustrated in Fig. 3. Production is set at 1.25 million pieces per year, and the estimated life of the process is eight years. The investment required for Plan 1 is

nothing, Plan 2 is \$1,071,000 and Plan 3 is \$850,000. Sales for all three plans amount to \$1,025,000.

Plan 1 is an old process that has been in operation for many years and is fully depreciated. To meet the production schedule, it must operate on a three-shift basis. Plan 2 is a proposed process comprising a minimum number of highly mechanized automatic machines. It requires the least amount of labor and the highest capital investment. It meets the production schedule by working two shifts. Plan 3 is a proposed process involving a number of inexpensive, single-station machines at a minimum capital investment. It requires more labor, tools, etc., than Plan 2 but less than Plan 1. To meet production, it must operate on a two-shift schedule.

The comparison shows that Plan 2 is the best investment. It will earn \$69,358 more than Plan 1 in the first year of operation, after all expenses. It likewise will earn \$10,332 more than Plan 3 after

all expenses. If the management decides to invest in Plan 3 rather than Plan 2, it will lose \$10,332 in the first year and in all probability a greater amount in each succeeding year of operation. If it decides to make no investment at all and continues on with the old equipment, it will lose \$69,358 in the first year and a greater amount in each succeeding year.

With Plan 2 the company has \$93,713 available from depreciation plus \$130,126 from profit; a total of \$223,839 to repay the investment in the first year of operation. Thus, working capital may be restored in as little as 4.8 years.

Now, someone will say that this is not a good investment because it takes almost 5 years to restore the working capital. He is probably basing his conclusion on the popular but untrue concept that investments must pay off out of direct labor savings in one or two years. By this rule, Plan 2 would pay off in 7.7 years, yet there is a decided profit advantage in Plan 2 after all expenses and charges, including a suitable allowance for depreciation of the capital cost of the equipment.

The answer to the following question will discredit the short payoff rule once and for all. How can the payoff period be computed when there is no direct labor left in the product? This might seem far fetched, but it is not.



... short payoff proves someone has been asleep

In the next two or three years machine tools will require no direct labor whatsoever. If plans can be developed to pay back an investment in one or two years, it proves just one thing: that organization has been asleep at the switch and the time for modernization is long overdue. The time to modernize is any time that new equipment will earn more profit than old equipment after all expenses and charges.

The crux of all modernization analyses is the dependability of the available data. Solution of this real problem requires the experience, skill and know-how of providing figures for making comparisons. Since they deal with events that have not yet taken place, the problem resolves itself into one of estimating or forecasting operations 12 months in advance. It will be well to remember that the results will be only as good as the estimates and no more.

Whenever modernization or replacement programs are being considered, the Profit and Loss statement is always helpful. It is useful as a checklist to find new avenues of profit. The Profit and Loss statement is a complete list of every expense of a business operation. If there are any latent profits in a setup, they must come out of one or more of these expenses.

When estimating sales, it will usually be advisable to work with a market research specialist. In the example, the product is a rather small component of a much larger end product and, as a result, sales volume and prices do not change from one plan to the next. However, the sales potential of many products will vary with price and design and, under such conditions, market surveys will prove valuable in finding the right combination of variables. In any event, the analyst should never overlook the possibility for additional profit that might result from changes in design, price, quantity or quality.

### Simple Breakdown is Helpful

In the breakdown of the cost of sales many elements will be relatively easy to estimate while others will be difficult. Much of the mystery can be removed from the job by adopting procedures that reduce the work to simple terms.

An estimate of the time to change tools on one of the machines in Plan 2 is illustrated in Fig. 4. The estimator's job is reduced to estimating the tool life and the time to change the individual tools. This is a simple job for anyone to understand and evaluate. Combined with estimates for all machines, it provides a sound basis for selecting the number of setup men required for the proposed plan. Similar procedures are used to make the estimates for perishable tools and tool grinding.

The estimate for depreciation requires extra careful consideration inasmuch as it must recover the investment within the estimated life of the process and, at the same time, it must satisfy the requirements of the Bureau of Internal Revenue. The first step is to make an estimate of the expected life of the process. This should give consideration to two factors: market potential and the probability of obsolescence. It should not in any way be shortened by a desire for a fast recovery of capital. Such a consideration will not only distort the final result, but most certainly will be rejected by tax authorities.

The next step is to make an estimate of the salvage value of the equipment at the end of the useful life of the process. These two figures will provide the basis for computing the depreciation allowance. The example for Plan 2 will serve to illustrate. The estimated life of the process is 8 years, and the estimated salvage value of the equipment is 30 percent after 8 years of operation. The depreciation allowance, therefore, is  $\frac{1}{8}$  of 70 percent of the cost of the equipment. If it is felt that the depreciation allowance, arrived at in this manner, will not be acceptable to the Bureau of Internal Revenue, then the net profit should be reduced by an amount that will make up the difference.

All elements of the cost of sales that cannot be estimated individually are grouped under the heading of miscellaneous. This estimate is a percentage of direct labor based on past history. In the example, the figure is 15 percent.

Sales expense, in many cases, will be merely a percentage of the sales dollar. This is the case in the example because design, price and quantity are all constant. However, in many instances, these factors are not constant and, as pointed out previously, they provide additional profit possibilities. For example, some savings will be found in the cost of selling when a new design or reduced price model is introduced to the market. Here again the market research specialist will be a great help to the analyst.

Administrative expense, like all other factors of the selling price, will vary from one plan to another, and will offer possibilities for savings and increased profits. A plan involving a highly mechanized manufacturing operation will require less manpower in the payroll department, less record keeping in the cost department, and less service from the personnel department and, as a result, less administrative expense.

An estimate for interest should be included when, and only when, it is necessary to borrow money to carry out the plan. This interest should not be

confused with interest or return on the investment which is a part of the profit.

In general, estimating is an art requiring a wealth of skill and experience. Forecasting the potential profit of a complicated business operation is probably one of the highest forms of this complex art. Management will be wise to keep this in mind at all times, and particularly when it is selecting personnel to handle this part of the job.

In conclusion, the projected Profit and Loss comparison is one method but, by all means, not the only way of analyzing plans for modernization. Probably its most outstanding feature is that no expenses or charges to the operations of the proposed plans are omitted or added; it presents all the facts. Management can quickly appraise the effect of changes in any factor, for example, in labor rates, taxes, interest rates, or other, up or down. It can place a quantitative value upon the saving of one plan over another. It can measure the benefits of progress. It can even measure the cost of delaying modernization. It can be assured of getting the most out of its capital expenditures.

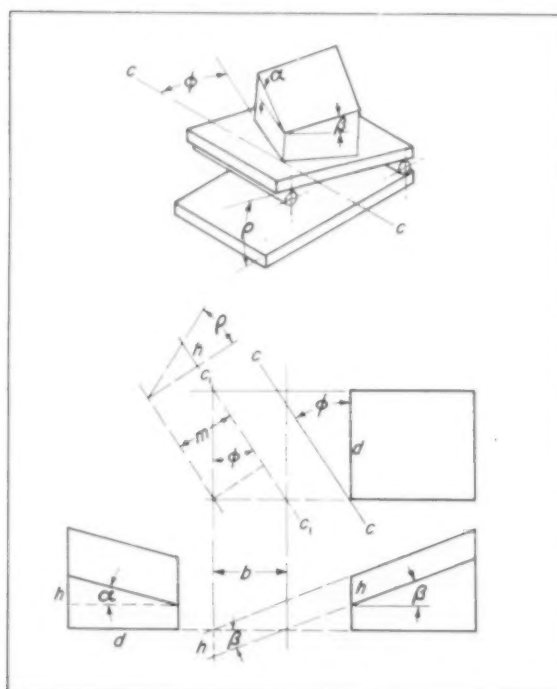
If we maintain a high degree of competition in our businesses and if we modernize as often as it is profitable, basing our conclusions on sound profit forecasting, we won't have to worry about prosperity. We will have prosperity.

Fig. 4. Reducing factors to simple terms facilitates estimating. This form, for example, indicates the time required to change tools.

THE CROSS COMPANY TOOL CHANGE LABOR ESTIMATE										2 ORDER NO.
Transfer-matic for Oil Pump Body										3 SHEET NO. 1 of 1
1 DESCRIPTION		4 TOOLS PRODUCTION	5 LINE PRODUCTION	6 EFFICIENCY	7 MAXIMUM DOWN TIME PER SHIFT 1.85 HOURS					
8	9	10	11	12	13	14	15	16	17	18
HEAD	TOOL SIZE & NAME	PIECES PER GRIND	CHANGE HOURS PER TOOL	NUMBER OF TOOLS	TOTAL CHANGE HOURS	TOOL FACTOR	CHANGE HOURS PER SHIFT			
A	Drill, 15/32 diameter	2,000	0.05	3	0.15	0.44	0.066			
	Drill, 0.213 diameter	2,000	0.04	12	0.48	0.44	0.211			
	Combination drill and ream	1,500	0.05	6	0.30	0.60	0.180			
	0.202 diameter	15,000	0.05	6	0.30	0.06	0.018			
B	Core Drill, 3/8 diameter	3,500	0.05	6	0.30	0.22	0.066			
	Rough bore, 1-5/8 diameter	15,000	0.04	12	0.48	0.06	0.029			
C	Core Drill, 3/8 diameter	5,000	0.05	3	0.15	0.18	0.027			
	Rough bore, 1-5/8 diameter	5,000	0.05	6	0.30	0.18	0.054			
D	Reamer, 0.500 diameter	2,000	0.05	6	0.30	0.44	0.132			
	Drill, 7/16 diameter	2,000	0.05	6	0.30	0.44	0.132			
	Drill, 15/32 diameter	1,800	0.05	6	0.30	0.50	0.150			
F	Drill, 21/64 diameter	1,800	0.05	3	0.15	0.50	0.075			
	Drill, 7/16 diameter	3,500	0.05	3	0.15	0.22	0.033			
G	Counterbore, 9/16 diameter	3,000	0.04	18	0.72	0.28	0.202			
H	Tap, 1/4-20									
TOTAL					96	4.38		1.375		

## Compound Angle Layout

Usually formulas for laying out compound angles involve use of two sine plates at right angles to each other, and a correction for setting them. The following formulas make possible the generation of a compound angle on one sine plate. This has the obvious advantage of a lower and more stable



setup, as well as simpler calculations.

Since compound angles are commonly given in two standard views on a drawing, angles  $\alpha$  and  $\beta$  are known. If the planes formed by these angles were extended, they would intersect the base plane along line  $c_1-c_1$ , at angle  $\phi$  (phi) from the face on which angle  $\alpha$  is shown. Angle  $\phi$ , then, is the angle of rotation of the part on the sine plate to bring line  $c-c$  parallel to the axis of the sine plate. Angle  $\rho$  is the angle to which the sine plate must be set. Angles are calculated with the following formulas:

$$\tan \phi = \tan \alpha \cot \beta$$

and

$$\tan \rho = \frac{\tan \alpha}{\sin \phi}$$

From the accompanying sketches:

$$b = h \cot \beta ; d = \frac{h}{\tan \alpha}$$

$$\tan \phi = \frac{b}{d} = \tan \alpha \cot \beta$$

Also,

$$h = d \tan \alpha ; m = d \sin \phi$$

$$\tan \rho = \frac{h}{m} = \frac{\tan \alpha}{\sin \phi}$$

These formulas have worked out satisfactorily.

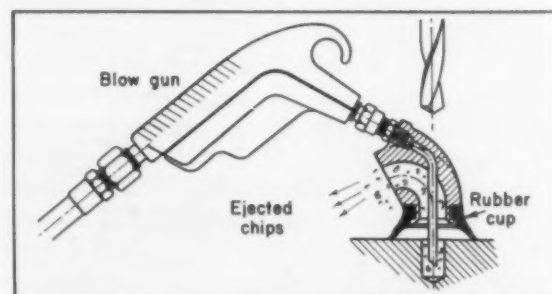
Walter Stockwell

San Fernando Valley Chapter

## Blow Gun Attachment

Cleaning out blind holes after drilling is troublesome since a direct air blast is dangerous. It is likely to cause chips to fly into the operator's face or moving parts of machinery. A more controlled puff of air may fail to remove all chips, causing difficulty in subsequent operations such as tapping.

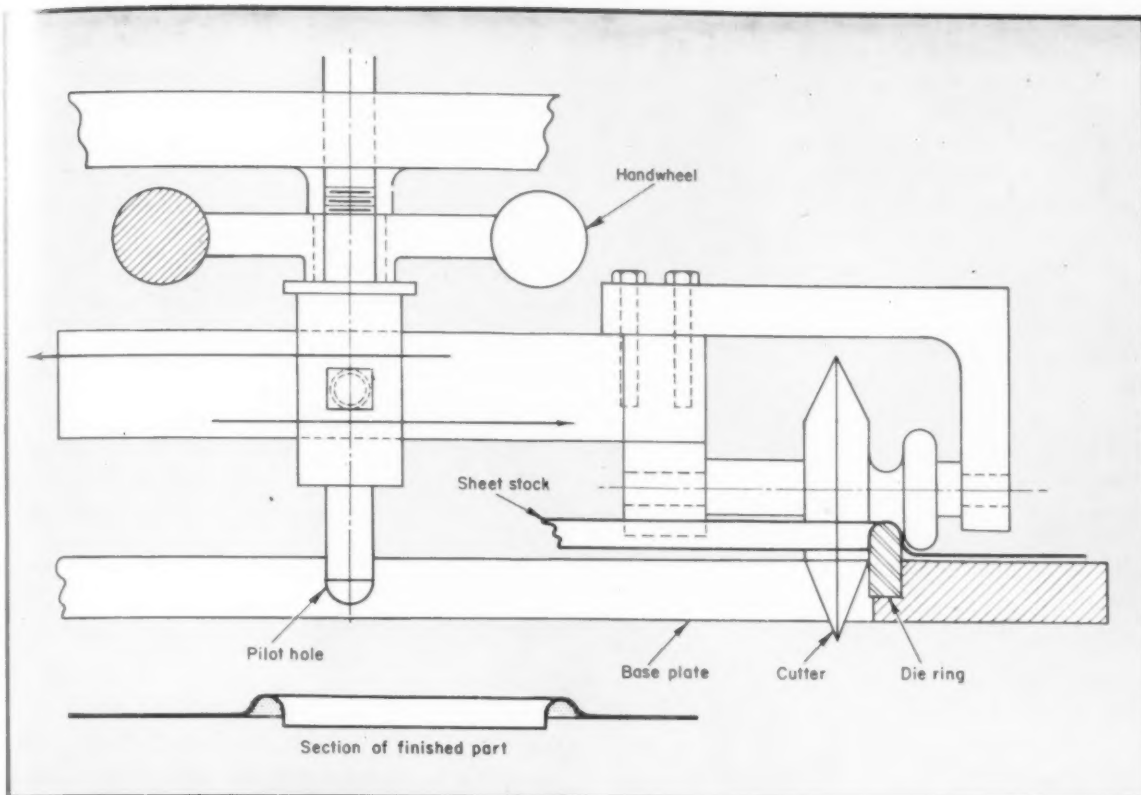
As a direct result of a safety campaign to reduce eye injuries in the plant, the attachment shown in the accompanying drawing was developed. It consists of a rubber suction cup to seal the hole, a tube to direct the air blast and an exhaust port. The device, manufactured by Saf-T-Blo, gives protection to the machine operator and permits faster chip removal since a full throttle blast



is directed against the bottom of the hole, and the chips are ejected in a downward direction.

C. P. Farr

Toronto Chapter



### Cutting and Forming Tool

The special tool shown in the accompanying drawing was designed to produce large-size holes with rolled rims. It also eliminates the need for a forming die for each hole of a different size. In operation a pilot hole is made at the center of the flat sheet which is then clamped to the base plate. The cutter is adjusted to a die ring by sliding the beam of the cutter holder in or out as needed. Handwheel feeds the spindle down on the work. As the cutter wheel is rotated it shears out a flat blank; the form roller comes down

gradually and forms a raised rim around the die ring as shown.

The device has been successfully used on copper, galvanized metal, 18-8 stainless steel and other sheet metal. Its action is somewhat like that of a can opener and it produces fewer waves and buckles than ordinarily occur in metal parts produced in a draw and form die.

•

C. T. Beall  
Kansas City Chapter

### Nest for Second Operation Dies

The question of how to locate workpieces for a second-operation of piercing, punching or perforating, is of paramount importance for both accuracy and speed. Of course, maximum accuracy is obtained when the nest entirely surrounds the workpiece, or at least enough so that it cannot shift in any direction during the cutting operation. On the other hand such complete nests greatly reduce the production rate.

Sometimes the shape and dimensions of the components are such that both high precision and

high production rate can be secured, as in the following case.

The component, shown in left side of illustration, has been stamped out in an ordinary blanking die. The two holes had to be pierced in a separate,

*Contributions for these pages describing short cuts for the tool engineer are welcome. Finished drawings are not necessary. Payment for accepted articles is made upon publication.*

second operation die. For several reasons a two-station progressive die could not be used.

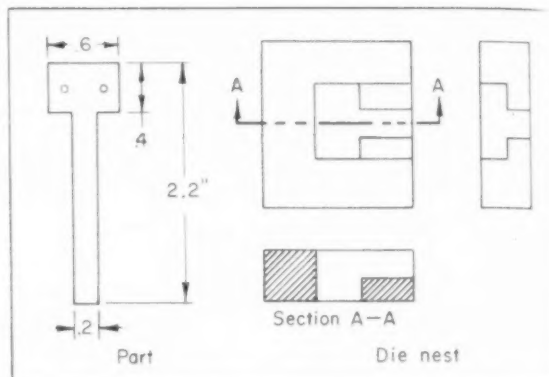
The piercing die has been with standard components, with the exception of the nest which is of somewhat special design, right side of accompanying sketch.

The nest was made in two levels. The first nest completely surrounds the head of the part to be pierced and a short portion of its leg. In order to make it possible to introduce and extract the blank, the second level of the nest was widened. To insure long life, the nest was made of tool steel and hardened.

In operation the component is held by its leg and the head is introduced through the top level into the die. When completely inside, it is lowered to the lower level. After completion of the piercing operation, the component is easily removed from

the die as it is raised to the upper level in the stripping action.

*Federico Strasser  
Santiago de Chile*



## Tube Bending Fixture

To avoid troubles encountered in bending mixing tubes used in hurricane lanterns and similar pieces, the forming fixture shown was designed. Three different sizes of mixing tubes are manufactured. The tubes are made from seamless brass tubing. The largest is  $1\frac{9}{32}$  inch in diameter with wall thickness of  $\frac{3}{32}$  inch.

Previously, the brass tubes had to be filled with melted resin before forming in a special bending fixture. Using this method, 20 percent of the tubes were broken and had to be scrapped.

With the new bending fixture shown, the bend of 180 degrees is made without filling the tubes. The mixing tube, A in the illustration, is put on a steel pin (4) and clamped between a fixed steel

block (6) and a movable steel block (13). The end of the tube is threaded and fits the half round clamp block. In the end of the steel pin is a hardened steel ball (8) held in the pin by a small steel pin (5). This pin acts as a pivot for the ball.

When the handle (29) is turned half a revolution in the direction of the arrow, the steel pin (4) fastened to the adjustable rack (24) together with the steel ball, follow the handle which is pivoted around the pin (7), forming the tube in 180-degree bend. Because the steel ball forms the tube from the inside, it is produced with a perfect radius and breakage is eliminated.

*Hjalmar Dahl  
Upplands Vasby, Sweden*

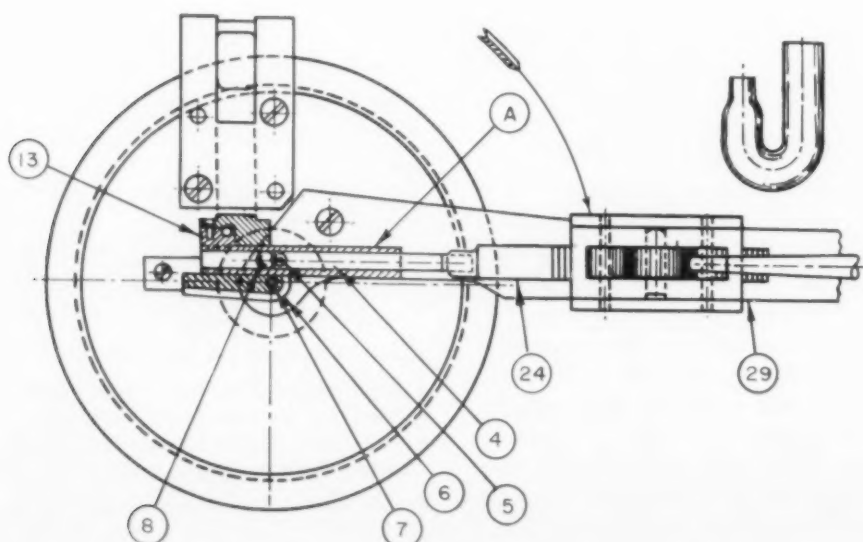
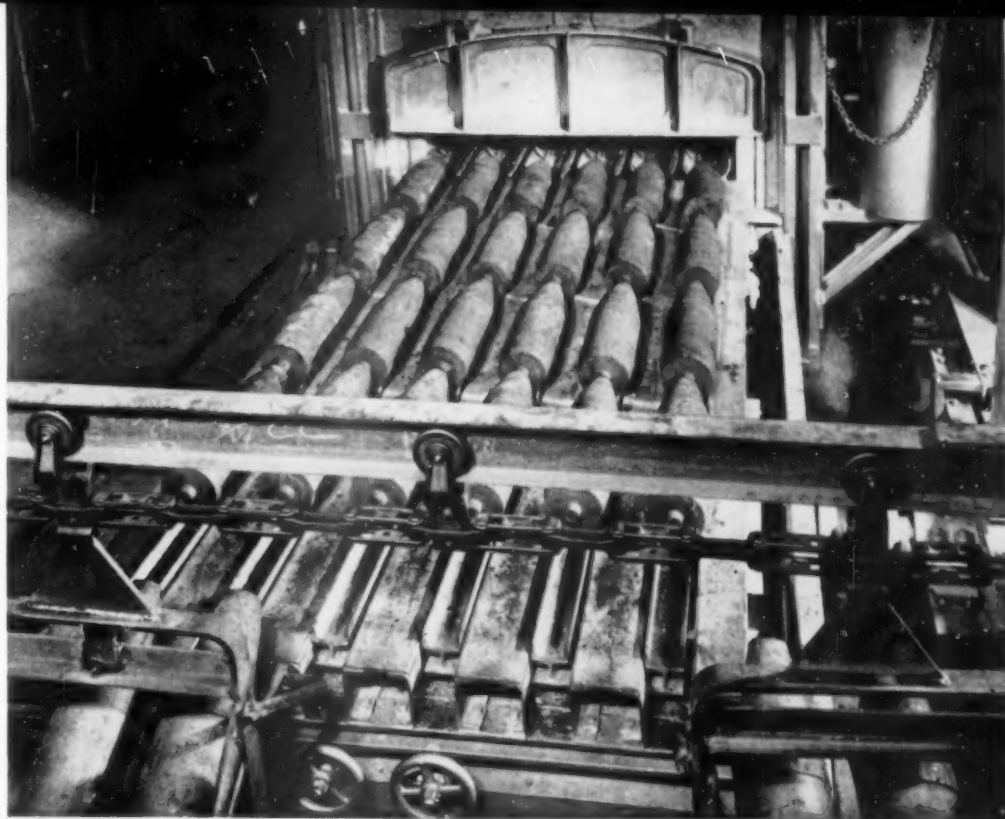


Fig. 1. Walking beam furnace for hardening 155 mm artillery shells. Small beams raise shells, carry them forward and then return below level of fixed beams.



## Tools for the HEAT TREATER

By A. H. Koch

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A TOOL RENDERS its best service when its use is limited to the purpose for which it was designed. Since the most important tool of the heat treater is furnace equipment, *Fig. 1*, it should be considered in terms of what it must do. Modern heat treating equipment heats a metal to a relatively high temperature, provides time for reactions to take place, cools, controls surface condition and handles the material in process. Since the importance of each depends on the final product desired, the quantity in which it is produced and the over-all minimum cost per part, each function should be analyzed individually.

### Temperature

Hardening of steel requires temperatures of from 1400 to 2400 F while annealing; normalizing and other similar softening or improvement operations require 1250 to 1900 F temperatures. Annealing of

nonferrous metals is usually conducted within a range of 800 to 1400 F. Tempering or drawing of steel products is usually done at temperatures of 250 to 1250 F. Stress relieving of products after extensive cold mechanical working or welding can be accomplished at temperatures below 1400 F.

The temperature to which any metal part is heated depends on its composition and the final conditions desired. The rate at which it can be heated is limited by its size and shape as well as by its heat absorption properties.

**Sources of Heat:** Common sources of heat for industrial heat treating furnaces are gas, fuel oil or electricity. Gas is the lowest in cost, most efficient and easiest to control in most localities. Efficient gas-fired furnaces must provide complete combustion over a wide range of heat rates. This may be accomplished with one control valve and automatic air-gas proportioning.

Fuel oil is more difficult to control and, at present prices, is more costly than gas. It is used in applications where it has inherent advantages or if a dependable supply of gas is not available. Electrical heat can be easily and accurately controlled but, except for a few locations, its operating cost is from 3.5 to 5 times that of gas. Electricity offers an excellent source of heat in plants that do not

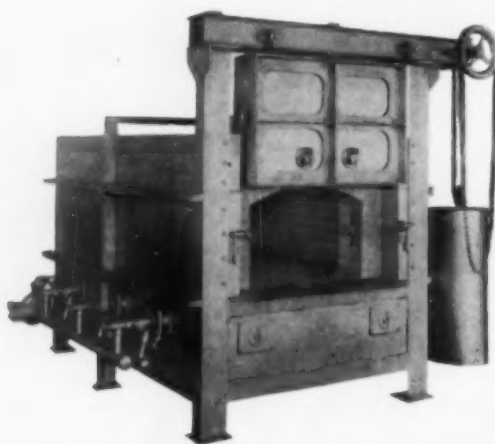


Fig. 2. Typical direct-fired oven furnace with counterbalanced door.

have access to gas or for applications where exact control is important. This article will discuss the features of gas-fired equipment.

**Heat Transfer:** Heat treating furnaces, Fig. 2, consist of an outer shell lined with refractory material, burner equipment located for uniform heat input and a means of supporting the parts being treated. Heat is transmitted by radiation and convection within the heating chamber. For operation above 1200 F, where radiation is more effective, a large number of low capacity burners is installed in the side walls, directed to project the products of combustion into the furnace. This puts heat into the refractory lining from which it is rapidly radiated to the parts. Heat is also transmitted by the natural circulation of hot combustion products inside the furnace.

Below 1200 F, the majority of heat is transmitted by convection. For faster and more uniform heating, gases in the chamber are forcibly recirculated by a fan through distribution ducts. With this system, an external mixing chamber for the products of combustion and recirculating gases can advantageously be used. Heat input is from a single gas

burner installed in this chamber.

**Furnace Temperature:** Heat treating furnaces are usually operated with chamber temperatures the same as, or only slightly higher than, the temperature to which the furnace charge is to be heated. The temperature of the parts being heated can be accurately controlled; the parts can be heated uniformly through their entire thickness.

For certain heat treatments of metals and for selective heating of a portion of a part, furnace temperatures are maintained considerably higher than the desired work temperature. The difference between these two temperatures is commonly referred to as the "head temperature." Heating in this manner is fast and is often called "rapid heating." Another variation of this method is direct flame impingement of a number of small burners on a portion of a part as it is slowly moved past the burner jets.

In most heat treating operations, the prime requisite is to accurately control the temperature so as to heat the part uniformly through its thickest cross section. To attain this end, furnaces are operated with practically no head temperature and are automatically controlled. Control equipment consists of a thermocouple, inserted into the heating chamber, which operates a sensitive electrical instrument that actuates a control valve. On-off, high-low, anticipatory and throttling types of controls are available.

In rapid heating, the temperature of the part is governed by the time it is exposed to heat. Control of exposure time may be by manual withdrawal or by regulation of the speed of the mechanism that feeds the part through the furnace.

### Cooling

Cooling during heat treatment of metals is necessary to change metallurgical characteristics or make possible the convenient handling of the product. An example of slow cooling is the annealing of certain steels to improve machinability. The slow rate of cooling through the critical range renders them dead soft. To attain this condition, parts are usually cooled in the furnace. Normalizing is a variation of annealing in which the parts are removed from the furnace after the required temperature is attained and are allowed to cool in air.

Rapid cooling or quenching provides a means of obtaining hardness by holding carbon in solution with the ferrite. This is accomplished by passing the steel through the critical range at a high rate of temperature reduction.

**Delayed Quench:** Sometimes it is necessary to cool a steel from the maximum temperature required by the heat treating process to a lower

temperature prior to the quench. This is frequently done with a product that has been carburized because quenching from the high temperature may cause austenite retention. Steel parts that have been carburized may have to be slow cooled from the carburizing temperature to below the critical temperature and then reheated to above it before quenching to reduce the grain size of the core, if ductility is necessary.

Nonferrous metal parts are not hardened by quenching but a rapid reduction of temperature after annealing is frequently used to prevent scaling of the metal when exposed to air. Metals, which are not affected metallurgically by such treatment, are frequently quenched so they can be handled immediately.

To remove heat, furnaces can be equipped with a cooling chamber or can be divided into zones, each operating at a different temperature. Chambers are equipped with tubes through which cold air or water is circulated. If heat removal must be rapid, the entire chamber can be water jacketed. If it must be very fast, a circulating fan and some form of fin cooler can be provided. For metal parts of thin section, the latter type of cooling can be equivalent to a quench and is called gas quenching.

Quenching can best be accomplished by immersing the metal into a liquid that is at a low temperature. The most commonly used quenching media are oil, water or brine. These are usually kept in open tanks, and the quantity of medium should be sufficient to prevent its temperature from increasing more than about 25 to 30 F when the largest batch of work is immersed in it.

For uniform hardening of steel, the quenching medium should be agitated. This can be accomplished by an external pump and proper manifolding or by a motor driven propeller in the tank with baffles to direct the flow.

Quench tanks that handle a large quantity of material per hour should have some form of heat removal so that the quenching media can be maintained at the proper temperature. Tanks containing oil or brine can be equipped with cooling coils through which low temperature air is circulated if the quantity of heat to be removed is not too great. For tanks that require removal of considerable heat, a circulating pump with a shell-and-tube type cooler proves an excellent solution. Water is used as the coolant in this type of installation. Tanks used for water quenching can be maintained at the proper temperature by introduction of cold water.

**Interrupted Quench:** An interrupted quench is desirable for steel parts that will readily distort when cooled rapidly. Such quenches also prevent surface cracks and provide a thin section part with hard wearing surfaces plus a high degree of ductility. The quenching medium is held at some temperature between 400 and 1000 F. This form of quenching is known as "Austempering", "Mar-quenching" or "Isothermal Quenching" and the quenching medium is usually molten salt. Special oils can be obtained for the lower temperature ranges.

The salt or oil is kept in an open tank which is usually equipped with a propeller type agitator. Heat removal is accomplished by air-cooling coils

Fig. 3. Modern salt-pot furnace equipped with fume hood for cyaniding.



**Table 1—Compositions and Uses of Common Gaseous Atmospheres**

Gas Composition <sup>a</sup> (% by volume)						Applications				
CO <sub>2</sub>	CO	H <sub>2</sub>	CH <sub>4</sub>	H <sub>2</sub> O	N <sub>2</sub>	Copper	Low C Steel (up to 0.2 C)	Med. C Steel (0.2—0.6 C)	High C Steel (above 0.6 C)	Special Steels
0.0	20.7	38.7	0.8	0.0	39.8		Carburizing Dry cyaniding Homogeneous carburizing Brazing & sintering	Carburizing Bright annealing Clean hardening Carbon restoration (Skin recovery) Dry cyaniding Brazing	Bright annealing Clean hardening	Clean hardening Tungsten Molybdenum and cobalt high-speed steels
10.5	1.5	1.2	0.0	0.8	86.0	Bright annealing Sintering				
5.0	10.5	12.5	0.5	0.8	70.7		Bright annealing Brazing	Up to 30 min. exposure Bright annealing		
0.05	1.5	1.2	0.0	0.0	97.25	Bright annealing	Bright annealing	Bright annealing Clean hardening	Bright annealing Clean hardening	
0.05	0.05	3.0 to 10.0	0.0	0.0	Balance	Extra bright annealing	Extra bright annealing			Clean annealing Stainless Steel and Silicon steel
0.0	0.0	75.0	0.0	0.0	25.0		Rapid deoxidation of surface metal Brazing Sintering			Bright annealing Stainless Steel and Silicon steel
0.05 to 2.0	0.05 to 1.0	50.0 to 99.8	0.0 to 0.4	0.0 to 3.5	Balance		Rapid deoxidation of surface metal			Bright annealing of stainless steel & silicon steel

<sup>a</sup>Note: Compositions are based on use of natural gas as the base gas for atmosphere production.

in the tank. Provision must also be made to introduce heat into the quenching medium to melt it down, heat it to required temperature and maintain it at temperature during periods when no material is being quenched. Gas-fired immersion burners are ideally suited to this type of application because the heating tubes can also be utilized for air cooling.

Quench tanks can be equipped with control equipment to automatically maintain the temperature of the quenching medium. Tanks for interrupted quenching have a control instrument with high and low contacts, and a control valve in the gas supply line. This control system will supply heat to the quenching medium when the temperature is below the desired setting, shut off the heat when desired temperature is reached and allow air to flow through the cooling coils when the desired temperature is exceeded.

### Surface Conditions

To prevent scaling or decarburizing during heat treatment, metal parts must be protected from exposure to combustion products or air. This can be done by packing the parts in containers and filling the voids with some inert material, heating the parts in molten salt or keeping the parts surrounded with gases that will not react chemically with the metal.

For steel parts that must have hard wearing

surfaces and ductile cores to withstand applications of force, carbon is added to the outer surface. This is accomplished by heating the parts to a temperature of from 1600 to 1750 F in the presence of a carbonaceous material which may be solid, liquid or gaseous.

Another common method of providing a hard wearing surface on steel parts is by cyaniding which introduces carbon and nitrogen into the metal. This process produces a harder surface but the depth of hardness is not as great and the case does not diffuse gradually into the core as in carburizing. Cyaniding is done by heating steel to a temperature of 1400 to 1650 F in a molten salt or gaseous medium (dry cyaniding) containing carbon and nitrogen.

A more recent method of case hardening steel, known as carbonitriding, consists of forming a carburized case over which a case containing nitrogen is applied. This gives a very hard case with a foundation of considerable depth and good diffusion into the core. Heated steel is exposed to a gas atmosphere that carburizes it and ammonia is added to the atmosphere to supply nitrogen.

The oldest means of surface protection in a fuel-fired furnace is operation of the burner equipment with a slight deficiency of air to avoid free oxygen in the products of combustion. This somewhat reduces scaling and decarburization during heat treatment.

Placing steel parts in a metal container and sur-

surrounding them with small particles of solid material during heat treatment is referred to as the pack method. The pack material used to prevent scaling and decarburization is usually iron or steel chips and turnings. For carburizing by the pack method, the pack material is a carburizing compound that usually contains charcoal and charred bone.

For protecting steel parts during heat treatment and for carburizing or cyaniding in a liquid bath, molten salt is used. Salts of various chemical composition to give the desired reaction with the metal being treated are available. To prevent scaling and decarburizing of steel, a salt with a carbon potential to balance the carbon content of the steel should be selected. A salt with a high carbon content is used for carburizing and a cyanide salt is used for cyaniding. Molten salt is used in a pot type burner, Fig. 3. This equipment consists of a pot suspended by a flange in a refractory lined heating chamber and the combustion products circulate between the pot and refractory.

Gaseous media for the surface protection of metals during heat treatment and for the introduction of additional elements into the surface of metal parts are called prepared atmospheres. Many types of atmospheres are available. Compositions of those most frequently used and their common applications are listed in TABLE 1. For carburizing the gas is usually enriched with about 10 percent raw natural or propane gas to increase the carbon potential. For dry cyaniding (gaseous medium) and carbonitriding the atmosphere is enriched with about 10 percent raw natural or propane gas to increase the carbon potential and about 15 percent ammonia to provide nitrogen. Gaseous atmospheres are produced in generators such as that shown in Fig. 4.

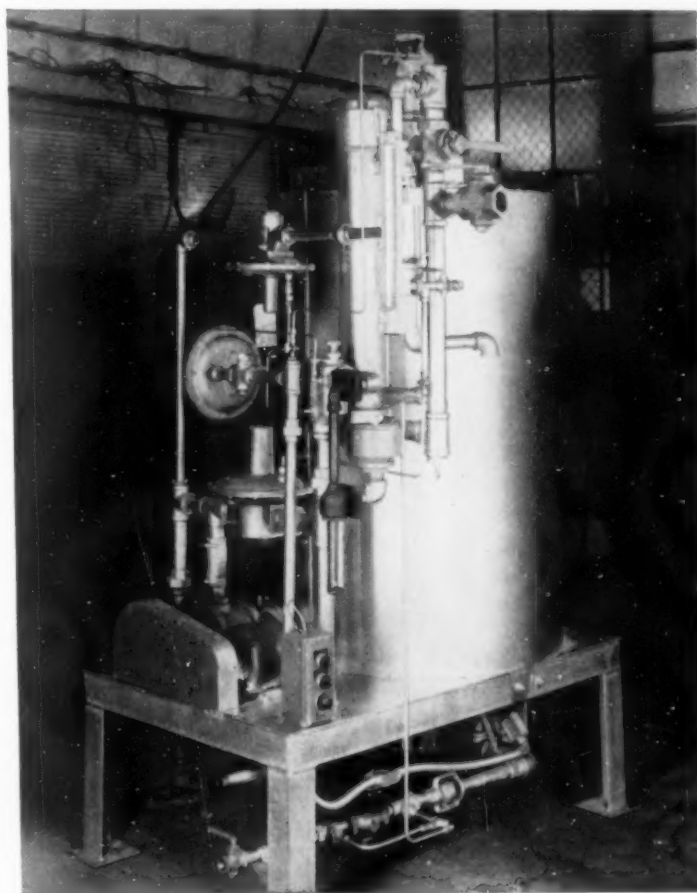
For the pack method of surface protection or pack carburizing, ordinary direct-fired furnaces are used. The containers and packing material prevent products of combustion or air from contacting the parts being heat treated. At the conclusion of the heating cycle, the containers are usually removed from the furnace and the parts are not taken out until they have cooled to practically room temperature. This procedure prevents scaling by exposure to air while at oxidizing temperatures.

Heat treating furnaces in which prepared atmospheres are to be used must have some means of preventing the products of combustion from mixing with and contaminating the prepared atmosphere. This is accomplished in small furnaces by muffles made of heat resisting alloy steel or silicon carbide. The muffle is installed in the furnace in a manner to allow products of combustion to circulate freely around, but not enter it. The parts to be heated are placed in the muffle. Sufficient prepared atmosphere is introduced into the muffle to keep it under a slight pressure. Muffle furnaces are either hori-

zontal with a door opening at one end, Fig. 5, or vertical with a removable top cover.

Muffle walls must be thin to obtain rapid heat transfer through them. Horizontal muffles wider than 30 inches or vertical muffles greater than 30 inches in diameter, to have sufficient structural strength to support their own weight at elevated temperatures, require relatively thick walls. It is therefore difficult to accurately control the temperature inside large muffles.

The requirements for controlled atmosphere furnaces of large sizes have led to the development of the radiant tube. This unit burns gas in a heat



**Fig. 4. Typical prepared atmosphere generator of 500 cubic feet per hour capacity. Generators are available with capacities from 150 to 35,000 cubic feet per hour.**

resisting alloy tube. When installed in a furnace so that the inlet and outlet ends of the tube are outside the furnace casing, the products of combustion are kept out of the heating chamber, Fig. 6. Heat is radiated from the tube surfaces to the charge and to the refractory lining of the furnace.

A furnace equipped with radiant tubes can have the entire interior filled with atmosphere gas. To prevent excessive leakage, the furnace casing is

welded gas tight. In effect, a radiant tube furnace is a muffle furnace turned inside out.

The best radiant tubes operate under suction and provide a uniform temperature over the entire tube length. Also, with this type of tube, if a small leak should develop, atmosphere gas will be sucked into the tube rather than products of combustion be projected into the atmosphere. This prevents contamination of the atmosphere and avoids the necessity of immediately taking the furnace out of production.

It is extremely important in gas carburizing and dry cyaniding to arrange parts in the furnace so that there will be space for atmosphere to flow over all surfaces to be treated. Surface-to-surface contact cannot be tolerated. Line contact is permissible if the surrounding spaces are not constricted. Point-to-point contact is most desirable. It is often necessary to provide fixtures on which the parts can be placed to allow for the proper clearance around them.

Atmosphere furnaces are often equipped with

circulating fans that rapidly force the atmosphere through the furnace charge. Fans make possible greater heating rates especially for parts that have a high density of loading. Circulating fans are desirable if the atmosphere is to impart certain elements to the metal because the reacted atmosphere must be replaced by a fresh supply to make the chemical reactions continuous.

### Heating Cycle Time

Time is an important factor in good heat treating practice. A piece of metal can be brought up to the required temperature as fast as it can absorb heat if uniformity of temperature throughout its cross section is not important. If the temperature of the core must be the same as the surface temperature, sufficient time must be allowed for heat to penetrate to the innermost part. Rates of penetration are about  $\frac{1}{8}$  inch in 5 minutes for steel, and for copper about  $\frac{1}{8}$  inch in 3.5 minutes.

Shape, thickness or abrupt changes in cross section of a part may make it necessary to heat at a slower rate to prevent distortion, creation of high internal stresses or cracking. Certain metals, such as some types of alloy steels, must be heated at slow rates to allow sufficient time for completion of metallurgical changes. It may be necessary, after a part is at the required temperature, to hold it at that temperature for a period of time.

The rate at which heat-treated parts are cooled

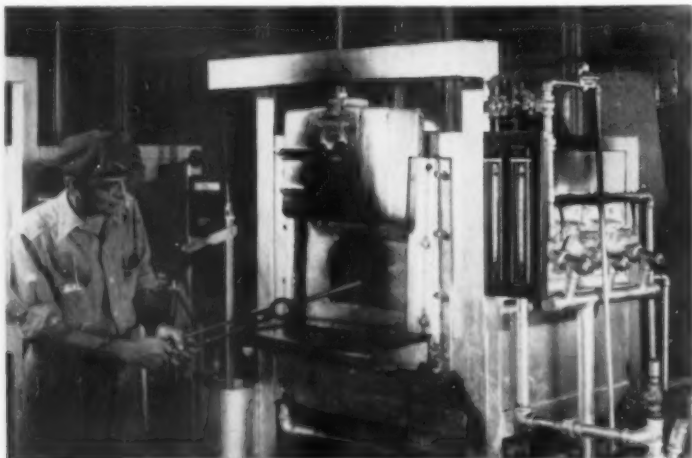
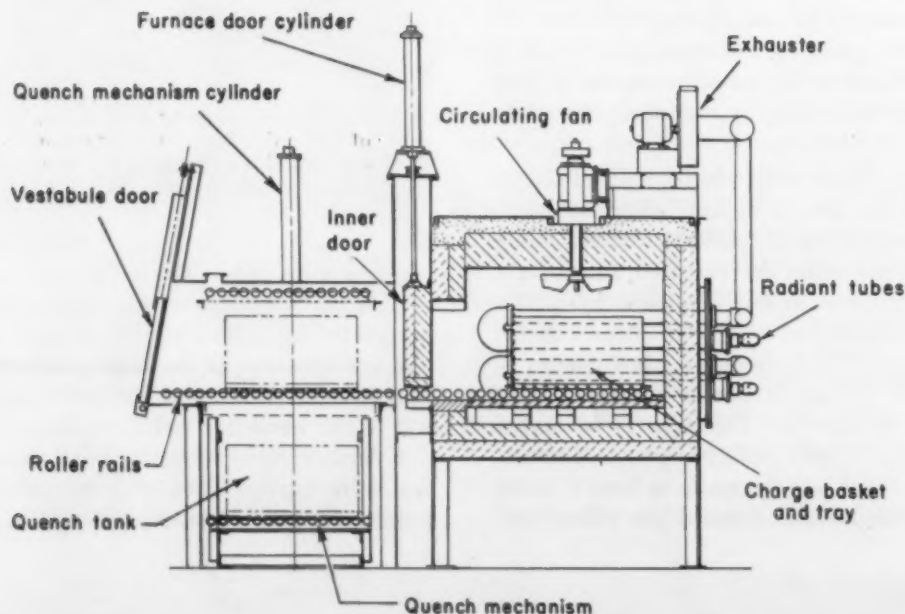


Fig. 5. (left) Standard muffle furnace with an external gas generator.

Fig. 6. (below) Small radiant tube batch furnace equipped with built-in quench and vestibule so parts are not exposed to air while at accelerated oxidizing temperatures.



depends on the metallurgical characteristics that must be obtained. When different rates of cooling are required, a time-temperature cycle must be adhered to and provision be made to attain the proper rates of temperature reduction.

In batch furnaces, where the charge remains stationary during treatment, the time a charge remains in the furnace is governed by the operator. Temperature changes can be made to produce any desired cycle. To quench a part from a batch furnace, it must be removed from the furnace and immersed into the quenching liquid.

Parts are sometimes cooled in the batch furnaces in which they are heated. If the cooling time must be shorter or higher production is necessary, the charge must be removed from the furnace for cooling. Cooling chambers, from which heat is removed by water or cool air circulation, can be used for this purpose.

Continuous furnaces, which have a door at each end and some means of conveying the material through the furnace, can be operated to provide definite periods of time in the furnace. Such furnaces can be zoned to definite time-temperature cycles. A continuous furnace can have a heating zone, holding zone and cooling zone, each operated at a different temperature. The length of each zone will govern the time the part remains in that zone. The total time each part remains in the furnace can be varied by changing the conveyor speed. However, the percentage of the total time spent in each zone will remain the same and can be changed only by revising the length of the zones.

With rapid heating furnaces, the time required to bring the part to temperature is greatly reduced. Therefore, the furnace heating chamber is relatively short. Also, because the temperature to which the charge is heated is controlled by the period of time at the heat, manual operation is not practical. Mechanical means for conveying the parts through the furnace and provision for accurate adjustment of the speed are required. Most continuous furnaces have variable-speed conveyor-drive mechanisms. If a conveyor is to be operated intermittently rather than continuously, the period between operating cycles can be automatically governed by an electric timing device.

### Furnace Types

The simplest and most commonly used furnace is the batch type oven. It has a horizontal hearth and a door opening at one end. Material is pushed into the furnace horizontally and lowered onto the hearth. A modification of this design has roller rails on the furnace hearth. Trays carrying the parts are pushed into and out of the furnace on these rails.

Another variation of this design is the carbottom furnace. In this furnace, the entire hearth and

furnace bottom is mounted on a car with wheels that run on rails. It can be withdrawn from the heating chamber and is well suited for handling large, heavy parts that must be brought to the furnace by an overhead crane.

For heat treatment of metals in salt baths or molten lead, a pot furnace is used. In this furnace, the parts are charged and discharged vertically either by hand or by overhead lifting and conveying mechanisms. The pit furnace is of similar design but has no pot and is equipped with a removable top cover, *Fig. 7*. In furnaces of this type, the charge is handled in a basket or on fixtures. It is usually charged and discharged vertically by an overhead hoist. These furnaces, if used with prepared atmospheres, have a fan in the base for ample circulation of atmosphere, provide more rapid heating and maintain uniform temperature distribution through dense loads.

Another design of batch furnace for handling heavy parts or a large volume of material is the heating cover. It consists of a flat base on which the charge is placed by overhead crane. A cover which includes side walls, top and burner equipment is lowered over the charge and rests on a sand seal at the base. After the products are heated to temperature, the cover is lifted and placed over another loaded base.

If prepared atmospheres are desired in this type of furnace, a sheet metal inner cover is used to confine the gas. The heating cover is equipped with radiant tubes and a circulating fan is mounted in the base. With this equipment, the charge can be cooled in atmosphere under the inner cover after the heating cover is removed. An advantage of this design is that one heating cover, which is the most costly part of the entire assembly, can service a number of bases and inner covers.

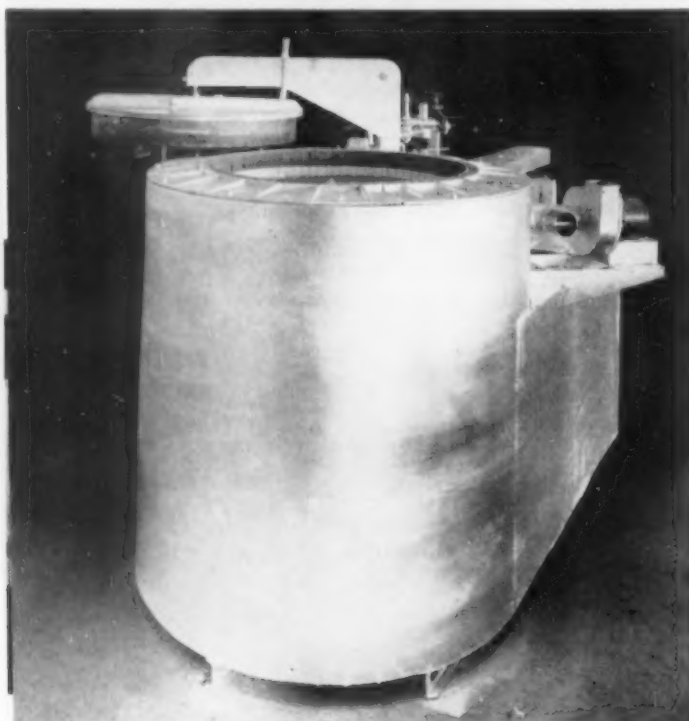
The most popular continuous furnace is the oven type with horizontal hearth and a door at each end. The furnace charge is conveyed on the hearth from one end of the furnace to the other. The simplest type of conveyor for such a furnace consists of rails running lengthwise on the hearth and a pusher mechanism at the charge end. The parts to be heat treated rest on the rails and each part bears against the preceding one. As a part is introduced into the entrance end, another is removed from the discharge end. The pusher can be mechanically, hydraulically or pneumatically driven.

**Handling Conveyors:** If the shape of the piece will not permit riding on rails, it is frequently possible to support it on shoes or similar fixtures. For relatively small parts, alloy steel trays can be used on the rails. Another popular form of handling mechanism is a series of continuous chains. The parts to be conveyed through the furnace are placed

directly on the chains or in baskets that ride on the chains. For relatively low production of lightweight parts, a modification of the chain type conveyor, consisting of a full-width mesh belt, can be installed in the furnace. Such belts can be woven wire or fabricated of small cast alloy-steel links and pins.

A satisfactory type of handling mechanism for a continuous furnace is the roller hearth. This consists of a series of alloy steel tubes that extend across the width of the furnace to form the hearth.

**Fig. 7. Pit type convection furnace with top open as if for charging.**



Each tube can be rotated and extends through the side walls of the furnace so that bearings can be mounted where temperature is not excessive. The rollers may be from 3 to 7 inches in diameter and placed on 4 to 12-inch centers. A sprocket, mounted on one end of each roller, is chain-driven through a variable-speed reducer.

The walking beam, *Fig. 1*, is another form of furnace conveyor mechanism. It consists of two series of horizontal beams that run lengthwise through the furnace and form the hearth. Every other beam is mounted stationary at a fixed level. The alternate beams can be mechanically raised and lowered above the top of the fixed beams and can be moved forward and backward a fixed distance from 12 to 24 inches.

A vibrating hearth is often used for conveying small, lightweight parts through a continuous furnace. A hearth of heat resisting alloy steel is suspended in the heating chamber with the charge end projecting out of the furnace. A drive mechanism vibrates the hearth to move the parts from the inlet to the outlet end of the furnace.

An unusual form of mechanical handling for heat treating furnaces is the slow-speed rotary retort. In place of the hearth there is a circular retort, which can be rotated, extending lengthwise through the furnace. It has an opening for charging at one end and one for discharging at the other. This improves uniformity of temperature and affords a means of continually exposing all surfaces of the parts. This type of equipment can be used in a batch or a continuous furnace.

If designed for batch operation, the entire furnace can be tilted so that the charge end rises and the discharge end lowers for ease in loading and dumping. If used as a continuous, *Fig. 8*, furnace the inside of the retort has a raised spiral flange to slowly feed the charge through the retort.

Another popular type of furnace has a rotary hearth. The circular hearth is horizontal and slowly revolves around a vertical pedestal. At one sector of the furnace side wall are two adjacent door openings. The charge is placed on the hearth through one of these. After a part has gone around the circle, it is removed through the other opening. This design of furnace usually requires but one operator for both loading and unloading.

**Provision for Cooling:** The manner in which heat treated parts are to be cooled is an important factor in the selection of a mechanical handling system for a furnace. For applications requiring slow cooling, the mechanical handling system of the furnace is usually extended through an enclosed cooling chamber that is directly connected to the discharge end of the furnace. In cases where air cooling is desirable, the furnace conveyor is frequently extended into the room. A variation of this system is to end the furnace conveyor just beyond the furnace outlet with arrangements for the parts to fall into tote boxes or onto another conveyor.

For quenching, the parts must be rapidly removed from the final heating zone of the furnace so that there is no loss of temperature prior to immersion in the quenchant. Some parts can be dumped into the quenchant in a random manner. Others, which will be distorted or physically damaged by dumping, or are too heavy to be dropped, must be lowered on a tray or fixture into the quenchant.

If the parts can be dumped, the furnace handling system can be terminated in the heating chamber with the parts falling through a chute into the quench tank. If a prepared atmosphere is used in the

furnace, the chute is extended into the quenchant so that parts are not exposed to air during transfer.

If the parts must be lowered into the quenchant in a tray, the best practice is to use the tray that conveyed the parts through the furnace. This avoids the necessity of transferring heated parts from one conveyor to another. A lowering mechanism is provided in the quench tank, which, when in its raised position, is at the hearth level of the furnace. A fast pull-out mechanism quickly withdraws the loaded trays from the furnace heating chamber onto the quench mechanism. The tray is then immediately lowered into the quenchant.

Entire mechanical handling systems can be completely automatic in operation, including opening and closing of furnace doors. With electrical interlocks, complete cycles can be run through without any manual manipulation.

If the heat treating operation requires a prepared atmosphere, the quench mechanism can be hooded so that treated parts are not exposed to air while being transferred from the furnace to the quench. The same atmosphere used in the furnace is usually used in the hood.

Some parts must be press quenched to maintain close tolerances. Small openings, with doors, can be provided in the furnace wall so such parts can be manually removed from the furnace conveyor and placed between the dies of the quench press.

Mechanical handling systems can be used to re-

production line. Such mechanized and controlled lines insure accurate duplication of complete heat treating cycles.

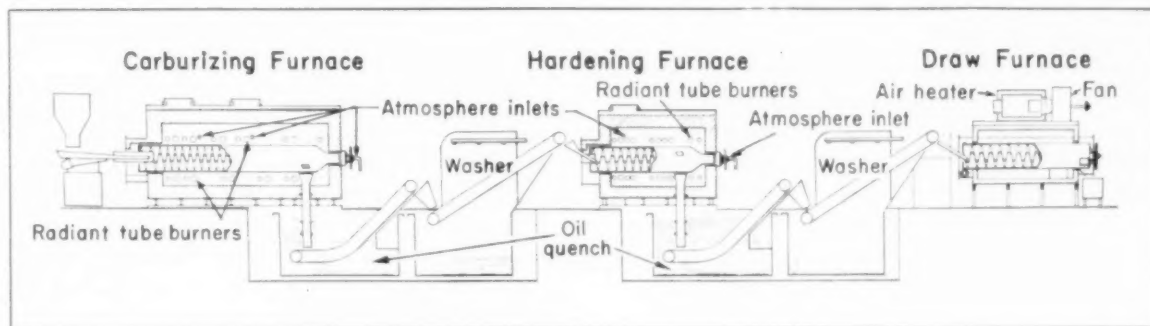
### Economics

How many of the design features that are available for heat treating equipment should be included in any particular installation depends on the production quantity and the accuracy of treatment required. One other item that must be considered, since it is usually the most important, is the economics of the operation.

Due consideration must be given to operating costs such as labor, fuel and maintenance, as well as the original investment. An analysis of these factors frequently indicates that the additional investment will not reduce operating costs sufficiently to amortize the investment within a reasonable period of time. For example, where production rates are not high, it can be less expensive to clean the product after heat treatment than to use a prepared atmosphere. In general, the higher the production rate the greater is the investment in heat treating equipment that can be economically justified.

One other consideration that has a marked bearing on the selection and design of heat treating equipment is the general plant layout. This includes such factors as how the parts will be brought to

Fig. 8. Line of continuous rotary retort furnaces used for heat treatment of bearing parts.



move parts from the quench tank. If the quench tank is equipped with a lowering mechanism, this device can usually be used to raise the charge from the tank. If parts are dumped at random into the quench tank, a continuous conveyor can be used to remove them. Conveyors can be of the cross-flight or bucket type. A rotary drum conveyor with an internal spiral can also be used.

For large production requirements furnaces with mechanical handling systems, quench tanks with conveyors and other mechanized equipment can be completely interconnected to form a continuous

and taken from the furnace and the amounts of floor space and ceiling height available.

The kinds of tools a heat treater should have are those that will produce a satisfactory product at the lowest possible cost per piece produced.

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# PREVENTING PRESS FAILURES

## Press

## Alignment and Speeds

By A. F. Gagne, Jr.\*

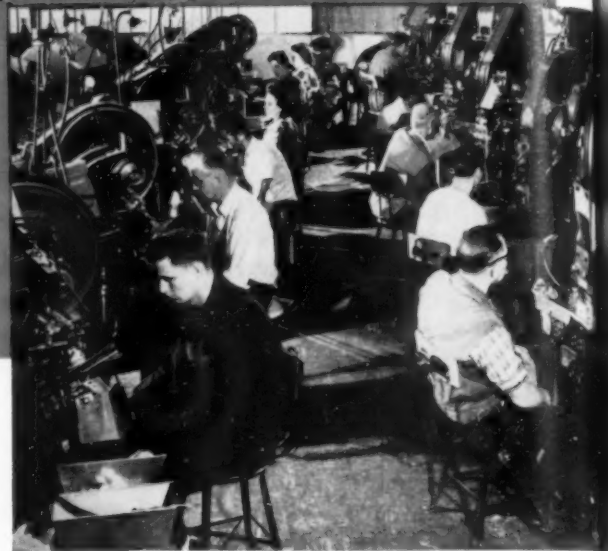
Consulting Engineer  
Binghamton, N. Y.

**T**O BE EFFECTIVE in preventing power press smash-ups and unnecessary die wear, safeguards must be designed to account for several factors, one of which is the press on which they are to be used. Faulty presses can ruin dies that have been carefully designed and constructed for economical and accurate production of parts. Proper ram alignment and press rigidity are factors requiring consideration but are sometimes overlooked, *Fig. 1*.

**Alignment:** Prolonged operation of C-frame presses beyond desirable limits causes deflection with each stroke and can permanently distort the gap. This is especially true of old, badly worn presses. Each stroke forces the ram bottom out of parallel with the bolster plate, causing considerable guide post and punch wear, and affecting accuracy of the work. Press inaccuracy is detrimental to blank and pierce operations but seldom hinders drawing.

A floating ram connection effectively prevents damage to die set as a result of press distortion or deflection. Floating action can be obtained

\*Senior member ASTE Binghamton chapter.



—Photo courtesy Volkert Metal Stampings, Inc.

**Fig. 1.** Press rigidity, alignment, and efficient lubrication are contributing elements necessary for steady work flow and reduced press and die repair costs.

by a T-slot in the top of the upper die shoe, *Fig. 2*, or through use of a ball contact, *Fig. 3*.

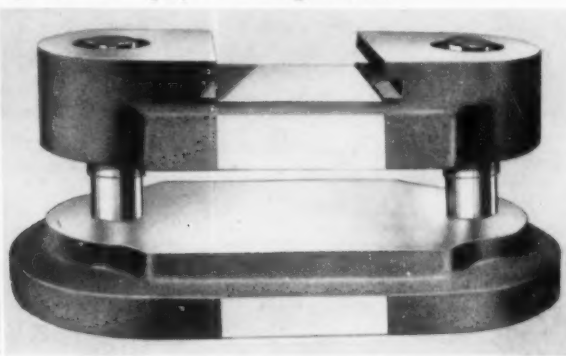
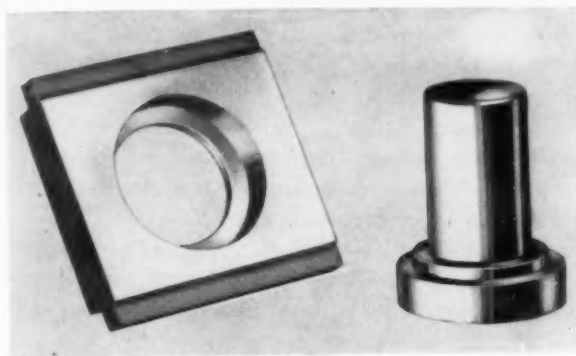
When presses are run without die guide posts, tool alignment is dependent on: (1) basic press accuracy, (2) care taken in setting dies and (3) the degree of shoe clamping. To facilitate die setting, it is helpful to provide a pair of setup pins which hold punch and die shoe in alignment at shut height. Bumpers between die shoes control shut height and help maintain parallelism. If gooseneck type clamps are used to secure the shoe, shims are not needed for rear support. Full-threaded, straight bolts should be positioned near the gooseneck to provide maximum holding pressure. Additional bolts are needed for dies installed in inclined presses.

Press overloading can cause permanent distortion. Presses should be examined occasionally for parallelism and flatness of bolster and squareness of ram bottom. Burrs under die shoe should be removed.

Generally, for smooth operation and extended life of press parts, tonnage requirements should not exceed 2/3 of rated press capacity. Calcula-

ons should be based on dull dies. For very accurate alignment, tonnage should not exceed half the capacity. Where permissible, shear ground punches to reduce required punching pressure, a simple solution to excessive press deflection, Fig. 4. Distortion of part is prevented by grinding shear on the die for blanking operations, and on the punch when piercing. Disadvantages are: (1) higher tool cost, (2) danger of tool deflection unless balanced V shear is used, (3) longer stroke required and (4) malforming of slug if shear is on punch or of stock if shear is on die. Staggering punch heights for multiple piercing gives equivalent results, if smallest punches strike work last.

Fig. 2. An adapter operating in a T slot floats the punch holder on the press ram and prevents strain on guide posts due to play or canting of ram.



—Photo courtesy Producto Machine Co.

To prevent the ram bouncing from punch to punch, stagger of punches usually coincides with point of break-through. Depending on the material, optimum stagger averages 25 percent of stock thickness.

Purchasers of C-frame presses should check ram gib lengths and the guaranteed minimum frame spring under rated load. For maximum precision, a rigid frame, straight sided press is recommended. A dieing press, equipped with a stock roll feed gives precision guiding and makes die setting operations more simple.

**Press Working Speed:** Excessive blanking punch velocity causes violent vibrations leading to early punch failure and, in extreme cases, results in a punch shattering on contact. Breakthrough shock also contributes to punch wear and fatigue. Stripping shock, resulting from fixed strippers, can also cause punch failure. If tool mortality is high, all three previously mentioned possibilities

Fig. 3. Sub-press provides automatic, closely-controlled alignment of punch and die and simplifies tool design and manufacture. The reusable unit shown is for piercing, ball contact is at the top.

should be checked to determine why alignment is poor.

In addition to punch speed, blanking tool shock depends on metal thickness and hardness. Velocity and shock of impact can be computed by the following equations:

$$v = (0.523) N \sqrt{y d \gamma}$$

$$S = stv$$

where:

$d$  = press stroke, inches  
 $N$  = press rate, strokes per min  
 $S$  = shock, ft-lbs per min per in.  
 $s$  = stock shear strength, psi  
 $t$  = Stock thickness, inches  
 $v$  = Velocity at impact, fpm

$y$  = Distance from point of contact to bottom of stroke

TABLE 1 indicates what can be done with first-class steel tools on presses of adequate capacity. Applications given in the table were increased to speeds consistent with reasonable tool life. Data should not be applied to carbide tooling, which is operable at speeds higher than steel.

In drawing, punch life may be affected by high speed, but limiting speeds are usually established by the tendency of the stock to pick up and gall on

—Photo courtesy Wales-Strippit Corp.

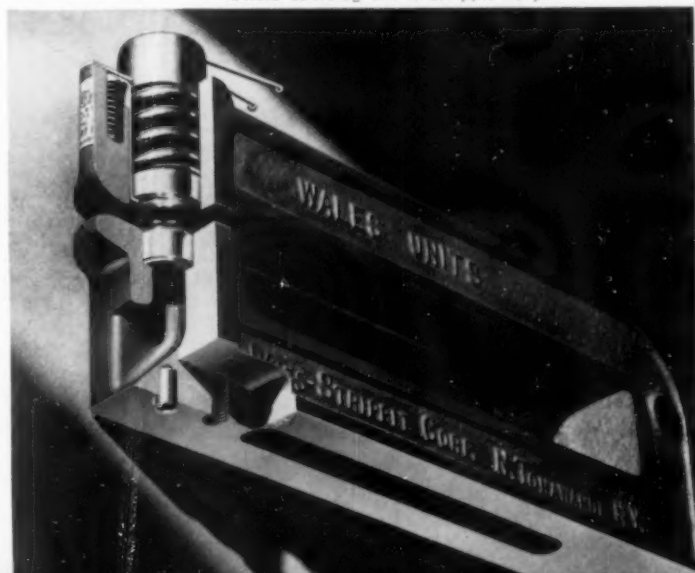


Table 1—Current Blanking Practice\*

Metal	Thickness, (in.)	Shock† (ft-lb/min/in.)	Application
Steel, C. R.	.060	50,000 - 70,000	Perforating, small parts
Steel, O. H.	.078 - .312	155,000 - 246,000	Small parts, coal screen
Steel, H. R.	.375	420,000	Ball Races
Steel, Silicon	.014	25,000 - 30,000	Laminations
Brass, hard	.081	81,000	Key blanks
Aluminum	.125	80,000	Extrusion blanks
Copper	.125	150,000	Switch parts
Zinc	.125	50,000	Extrusion blanks

†Reduce for delicate piercing or blanking punches.

Table 2—Suggested Maximum Drawing Speeds\*

Metal	Drawing Single Action	(fpm) Double Action†	Ironing or Burnishing (fpm)
Low-carbon steel	55	35-50	25
Steel (in carbide dies)	—	60	—
Brass, annealed	200	100	70
Copper	150	85	—
Aluminum, pure	175	100	—
Aluminum, highly alloyed	—	30-40	—
Zinc	150	40	—
Stainless Steel	40	—	—

†Recommended speed is lower than single action because of additional constraint introduced by blank holding.

\*Adapted from "Plastic Working of Metals and Non-Metallic Materials in Presses," E. V. Crane, John Wiley &amp; Sons, Inc.

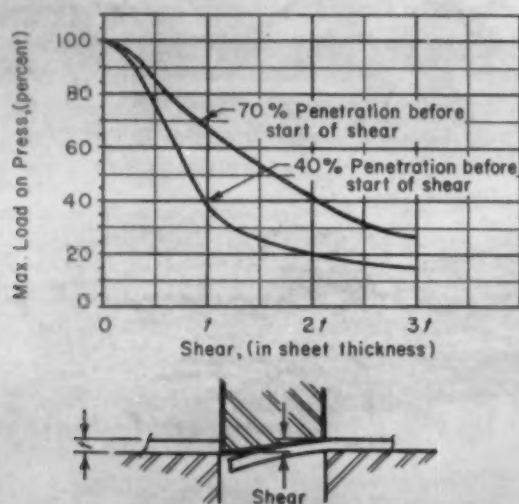


Fig. 4. (left) Shear on punch or die does not change horsepower demand, but reduces peak load on press, lessening deflection proportionately and minimizing snap back.

the die. Stock thickness is less of a direct factor on punch life in drawing than in blanking. Accepted velocity limits for various drawing operations are indicated in TABLE 2.

Significance of the velocity equation is often ignored by die setters. Dies are often moved to different presses to reduce draw speeds, ignoring variations in stroke. Die setters often fail to adjust punches for minimum travel past the work on draw-through operations. Making this adjustment reduces to a minimum the distance from point of contact to bottom of stroke, thereby decreasing break-through shock.

**Lubrication:** Proper lubrication can greatly reduce wear and replacement costs of gibs, slides and bearings. Hand lubrication methods consume time and are sometimes erratic. Centralized systems, Fig. 5, lubricate all points of wear with one hand pump stroke. More costly, fully automatic systems are actuated by press motion, air pressure or motorized pumps. Use of automatic press shut-down switches gives protection against the remote chance of lubrication failure.

This is second in a series of articles concerning prevention of power press smash-ups. Subsequent articles will discuss trouble detectors, overload relief, maintenance and operation.

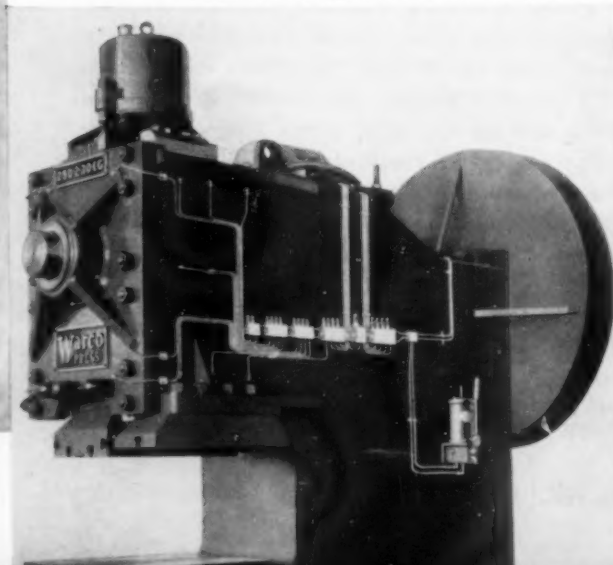
#### Acknowledgments

Appreciation is extended to the following companies for supplying information for this article:

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Sahlin Engineering Co.....Birmingham, Mich.  
Verson Allsteel Press Co.....Chicago 19, Ill.  
V & O Press Co.....Hudson, N. Y.

Fig. 5 (below) One-shot centralized grease lubrication system minimizes wear, prolongs life of press and tools. Measuring valves are near bearings, and flexible hoses lead to moving members; pump is accessible at side.

—Photo courtesy Federal Machine & Welder Co.



# BASIC TOOLING for Spinning Metals



Fig. 1. A large stainless steel dome is spun on a standard spinning lathe at Boeing Airplane Co.

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SPINNING OF METALS has progressed from an art to a production process worthy of consideration for large or short runs and for regular circular cross sectional, Fig. 1, or noncircular parts. Before 1950, it was general procedure to order a part spun with little or no regard for the tooling required. It was the responsibility of the spin lathe operator to analyze the part, and design and turn the necessary spin blocks before starting production. The majority of such operator-made blocks were not inspected, numbered or stored and soon lost their identity. This loose policy was drastically changed in 1950 because of the following factors.

1. Shortage of operators skilled in breaking down jobs and making blocks.
2. Insufficient spin lathes to permit block turning on the lathe.
3. Military requirements that tools be properly ordered and identified.
4. Numerous block failures.

\* Senior member ASTE Seattle chapter.

A good spinning program places the responsibility of tooling with the proper department. Spin lathe operators are now furnished the necessary tools for a job, and valuable operator and lathe time is not expended in block turning. All tools should be inspected, identified, boxed and available for re-use.

It is not the purpose of this article to discuss the intricacies of spinning, but rather to acquaint production and tool engineers with some of the more common types of parts and how they are tooled to give desired results. Since some of the information presented is based on production of critical airplane parts, it represents optimum procedures.

## Limits of Spinning Materials

Were it not for the close tolerances required on airplane parts, spinning would compare favorably with deep drawing. Commercial spin shops, turning out noncritical products such as aluminum pots

Table 1—Comparative Spinnability of Metals

Material	Rating*	Material	Rating*
<b>ALUMINUM</b>		<b>NICKEL ALLOYS</b>	
2 SO	1.00	Monel	0.75
3 SO	1.00	Inconel	0.75
52 SO	0.85	<b>COPPER AND ALLOYS</b>	
24 SO	0.75	Copper C.R.	1.00
17 SO	0.75	Copper H.R.	0.98
61 SO	0.90	Yellow brass	0.90
61 SW (Parts which do not require more than 15 minutes to spin)	0.60	Commercial bronze	0.85
(ST condition cannot be spun)		Phosphor bronze	0.65
<b>STAINLESS STEELS</b>		Silicon bronze	0.75
302	0.75	<b>LOW CARBON STEELS (1010, 1015, 1020)</b>	
321 (All gages over 0.072 must be spun hot)	0.85	Cold rolled	0.95
347	0.80	Patent level	1.00
17-7 PH "A" (All gages over 0.040 must be spun hot)	0.75	<b>MISCELLANEOUS</b>	
<b>HEAT TREATABLE STEEL</b>		Magnesium (Hot)	0.90
4130 (Gages over 0.072 should be spun hot)	0.85	Titanium (Hot)	0.88

\*Rating of 1.00 has been given to the material, of that group, most readily spun at room temperature.

and pans, have found that at about 2300 units, the unit cost of a 6 x 6-inch shell is about \$00.475 for either drawing or spinning. This cost includes tools and labor. With aircraft parts, where diametrical tolerances are held from  $\pm 0.010$  to  $\pm 0.030$  inch and gage tolerance is  $\pm 10$  percent, spinning costs are higher than those for drawing.

The number of scrap parts plus those requiring special inspection can be greatly reduced if tolerances are kept in mind when the part is designed. Tolerances greater than  $\pm 0.030$  inch could be specified for those parts whose dimensions are not critical. The same is true for gage tolerances because, in spinning, there is a tendency to either thin out or pack up the material.

It is an aid to the tool engineer if dimensions are all given from the surface that lies against the spin block. If dimensions are shown in this way, they will not have to be recalculated by the tool engineer.

**Spinnability of Metals:** Metals normally spun at room temperature include: aluminum and its alloys, copper, brass and the lighter gages of stainless steel. An indication of the comparative spinnability of sheet metals and tubing stock is given in TABLE 1. A rating of 1.00 is given to that material in each group that lends itself most readily to room temperature (70 F) spinning.

Room temperature formability of magnesium and titanium is poor but with the application of heat they can be readily worked. Heavier gages of stainless steel are worked at elevated temperatures

to reduce work hardening and to avoid the necessity of subsequent anneals.

Heat is applied with an oxyacetylene flame directed at the revolving workpiece. Some approximate working temperatures for materials that require flame spinning are: corrosion resistant steel, 1200 F maximum, 400-600 F optimum; titanium, 800 F maximum, and annealed magnesium, 700 F maximum, 500 F optimum.

Aside from the need for maintaining the elevated forming temperature, magnesium is among the easiest of metals to spin. From a plastic flow stand-

Table 2—Block Materials

Material	Usage
Hard maple	Breakdown blocks. Small quantity aluminum jobs with gradual contours. Finish blocks.
Richlite	Higher quantity production in aluminum. Finish blocks.
Tool steel	Swage tools subject to wear. Where internal part finish is critical.
Kirkstone and aluminum	Not recommended—will pick up under the tool.
Cerro-bend	Use to replace split blocks on low quantities. Melt out cerro after part has been spun.
Mild steel	High quantity aluminum and stainless. All heated blocks. Finish blocks.
Rezolin	Breakdown blocks. All materials—low quantities Aluminum—high quantities. Finish blocks. Excellent also for casting out-of-round blocks.

point, it is easier to spin than the aluminum alloy (3S-O) most used for spinning.

Spinners indicate that wall thickness requirements are readily maintained. Magnesium's characteristics of having less stiffness for the same thickness, as compared with aluminum, implements the spinner's feel of the temperature range. This is important because wrinkling occurs readily if the workpiece is too cool. The largest blank reductions in magnesium obtained at Boeing, regardless of forming process, have been by spinning.

**Block Materials:** Selection of block material is as important a factor towards producing acceptable parts as any other phase of spinning. The selection is based on quantity, tolerances and shape of part, and part material. In TABLE 2 are listed the common block materials and the uses to which each is put. Surfaces of blocks, regardless of the material used, must be finished to less than 100 micro-inches, rms.

Spin blocks are usually internally threaded, Fig. 2, and attached to faceplates for mounting on the spin lathe. These faceplates range in diameter from 3 to 20 inches. Faceplates for blocks up to 10 inches in diameter carry spuds with 1-inch by 8 threads; for blocks larger than 10 inches, spuds have 1 3/8-inch by 8 threads. The larger faceplates are drilled and countersunk from the back to permit use of wood screws for additional holding power on large

diameter wood blocks. Heavy steel blocks can be screwed directly on the headstock spindle.

**Blank Diameter and Reduction:** In order to determine the approximate dimensions for breakdown blocks (necessary to maintain gage tolerances), it is necessary to determine the flat blank diameter. For basically spherical and conical shapes, Fig. 3, the formula for determining blank diameter is:

$$D_b = 2[D + W + 0.1(D + W)]$$

where  $D_b$  = Blank diameter, inches

$D$  = Finished shape diameter, inches

$W$  = Finished height, inches

For basically bucket shaped parts, and with the same units, the blank diameter formula is:

$$D_b = 2[D + W - 0.1(D + W)]$$

Once the blank diameter is known, it is a simple matter to calculate the number of breakdown blocks required. Blocks should be chosen to reduce the diameter in steps not to exceed: 40 percent reduction

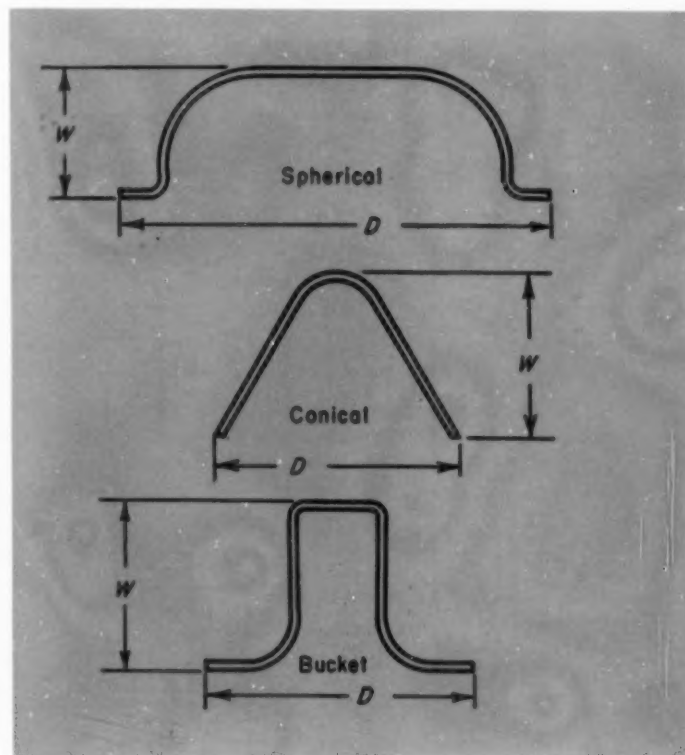
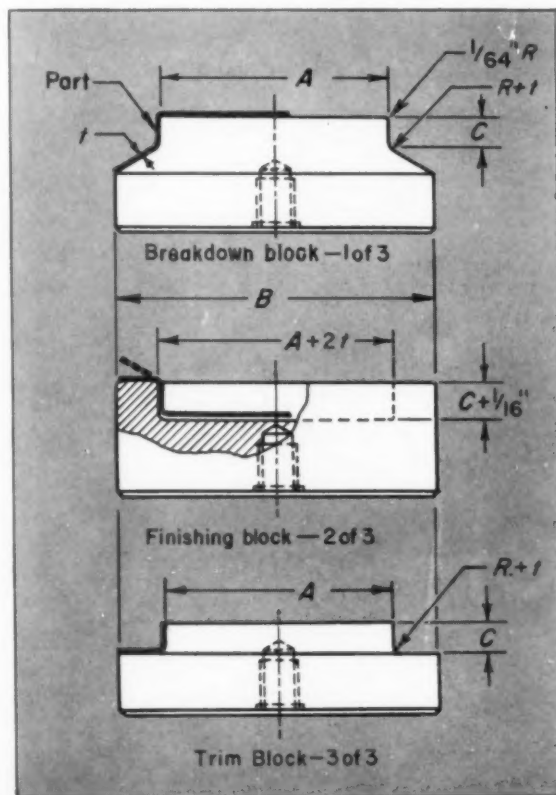


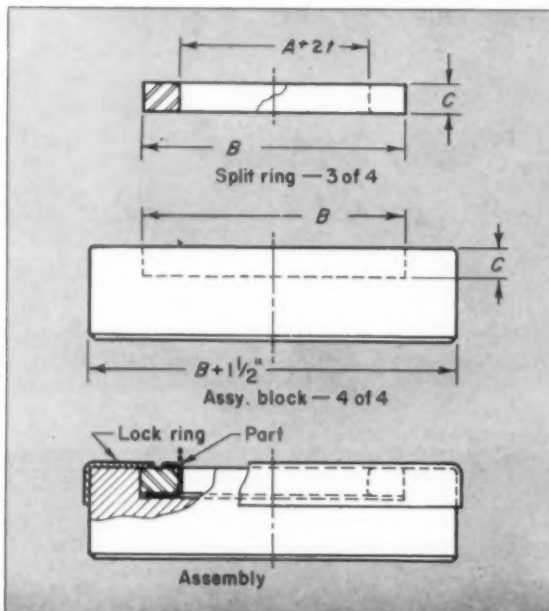
Fig. 2. (left) Typical series of blocks required to spin flanges and collars. Spin blocks of this type are internally threaded and mounted on faceplates.

Fig. 3. (above) Most circular spun parts can be classified into three basic groups.

for materials with spinnability ratings, TABLE 1, between 0.90 and 1.00, 30 percent for materials with ratings between 0.75 and 0.90, and 15 percent for materials with ratings less than 0.75.

### Typical Shapes

The spinning blocks for a simple flange are shown in Fig. 2. The flat blank is formed against the breakdown block, trimmed, reversed and set into the finishing block where the flange is spun down.



The part is completely trimmed in the last block. A separate trim block would not be fabricated for low quantity production.

The finishing block of Fig. 2 can be used in a number of ways. A flat blank can be spun over the outside edge, the inside edge, or both, to form angles, channels or shallow cups. If the amount of stretch required to form the inner flange results in excessive thinning or edge cracking, a breakdown block must be used.

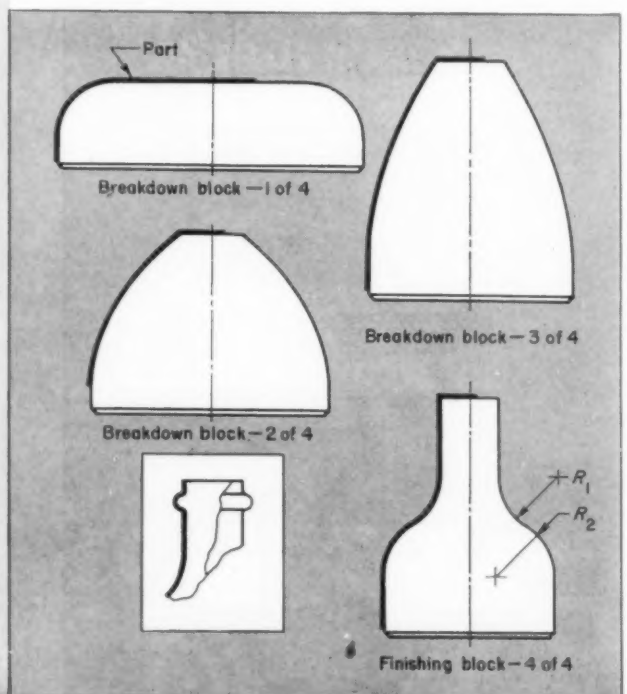
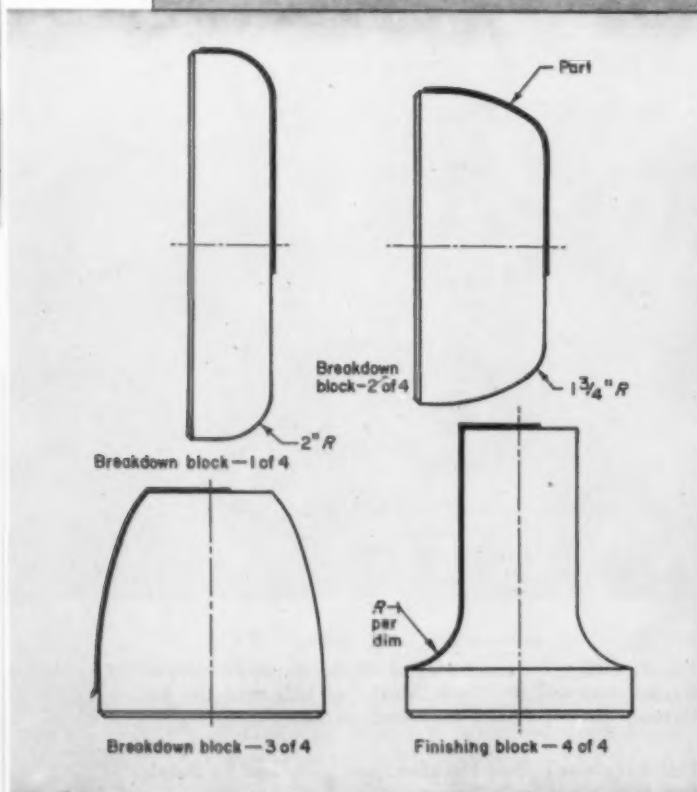
The part shown in Fig. 4 is made in three stages. The blank is spun over a breakdown block and inserted into a flanging block, identical with the breakdown and finishing blocks of Fig. 2, where the flange is spun to the correct angle. The bottom of the part is trimmed out and the split ring, Fig. 4, is folded around the part. The part and split ring are placed in the assembly block and, after being locked in position by the lock ring (itself a spun part), the material spun over the split ring.

Uniform wall thickness is difficult to maintain in

Fig. 4. (left) Where the spun part would encircle the forming block, the block must be made in sections so it can be removed.

Fig. 5. (bottom left) To maintain uniform wall thickness in bell shapes it is necessary to use several breakdown blocks.

Fig. 6. (bottom right) Funnel and reducer sections must be made in several steps with the material being worked onto the small end of the finishing block first. Inset shows method of applying bead to finished section.



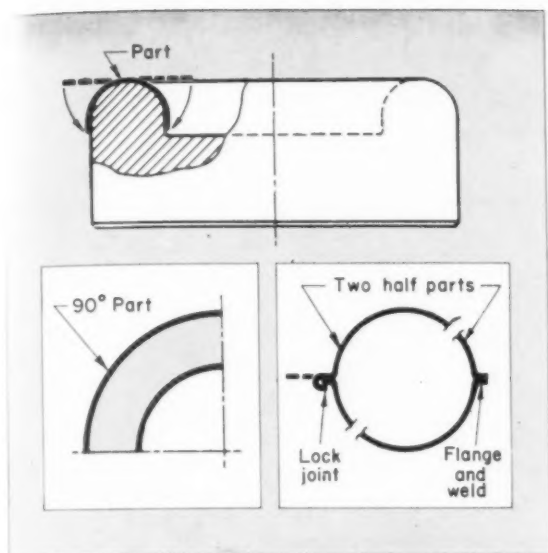


Fig. 7. Breakdown blocks are not required for ring and elbow shapes. Such rings can be cut apart and can be joined in various ways as shown.

spinning the shape shown in Fig. 5. The following procedure is helpful in achieving the desired results. After the blank diameter and number of stages are computed, three breakdown blocks are prepared as shown. It is important to keep the part smooth during all the breakdown operations since spinning lines that accumulate result in material thinning when they are removed on the finishing block. One or two full anneals will be required if this part is to be made of aluminum. If the part is corrosion resistant steel, two or more anneals will be required.

A procedure similar to that used for the part in Fig. 5 is used to produce the part shown in Fig. 6. When working on the finishing stage for this shape, it is important to bind the material on the small end of the block first to prevent the end from breaking off. Again, it is necessary to keep the part smooth through all spinning steps so that cracks will not open up during the last stage. Anneals are specified between steps if they are required to preserve the material ductility. A part made on this spinning block can be used as a reducer with a bead rolled in after the spin, as shown in the inset.

Rings and elbows can be made on a block similar to that shown in Fig. 7. When spinning, the outer flange is spun first and then the center is cut out. The inside flange can be spun or, in some cases, it can be formed on a hydropress. This type of circular form can be spun without breakdown blocks or intermediate anneals. This basic shape can be cut into pieces and joined by conventional methods, or two similar sections can be spun together with a lock seam.

A spinning of the shape shown in Fig. 8 is frequently specified. The difficulty of its production lies not in the actual forming, but in the planning of the sectional block. The core block and shell must mate accurately to prevent the shell sections

Fig. 8. Re-entrant spinning requires the use of sectional spinning blocks. Removal of the key allows shell to be removed from the spun part.

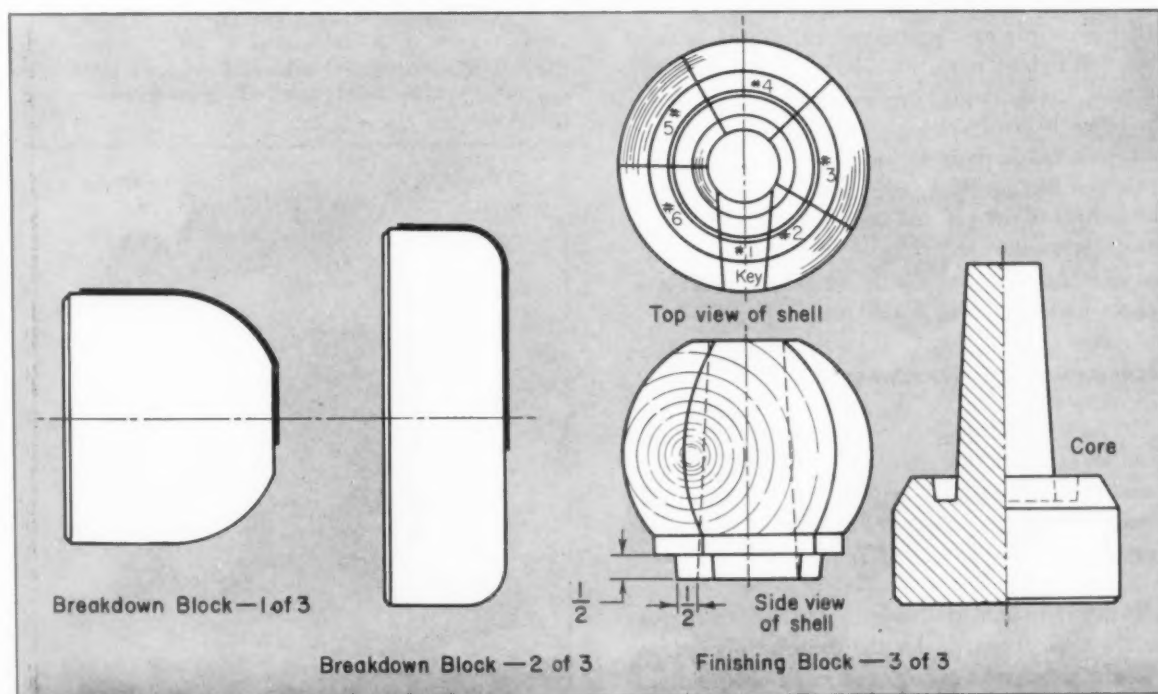
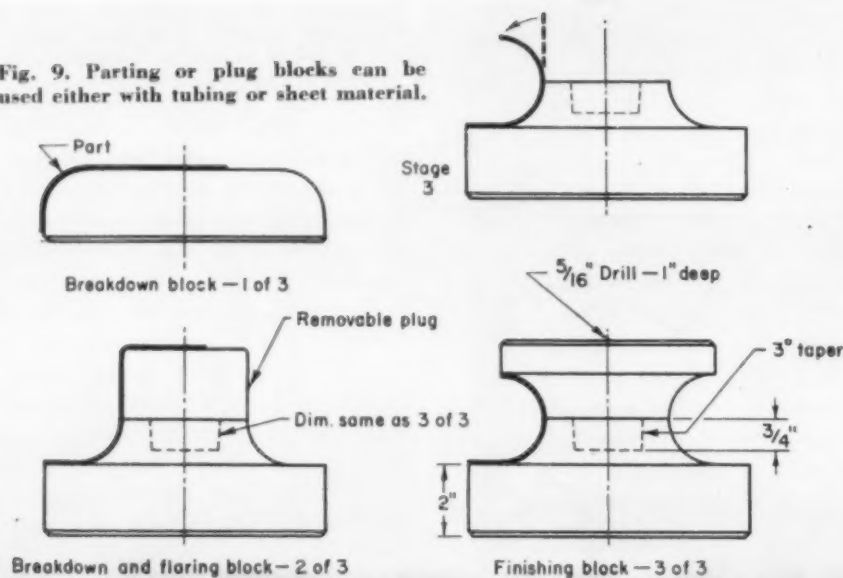


Fig. 9. Parting or plug blocks can be used either with tubing or sheet material.



from spreading and marking the spinning. Each section of the shell must be small enough to be withdrawn through the opening in the part.

The shell is laid out for as few sections as possible. A key section, Section 1, must be included that will, when it is removed, allow the other sections to fall out. The sides of the key section must be smooth so the section will slide freely between the adjacent sections.

Since the shell segments in a wood block are split rather than sawed, it is important that wood with a straight grain be selected. If few parts are required, the shells can be cast of Cerro-bend. Such shells are easily melted out in boiling water.

The principle of a parting block, Fig. 9, is used either with sheet metal or tube spinning. Venturi sections, for example, are made in this manner. The blank is broken down on the breakdown block. Further breakdown is accomplished on the breakdown and flaring block, with the plug in position. The bottom is cut out and the part is flared on the second breakdown block with the plug removed. The finishing plug is inserted in the second block and the part is spun to final form.

#### Accessories and Attachments

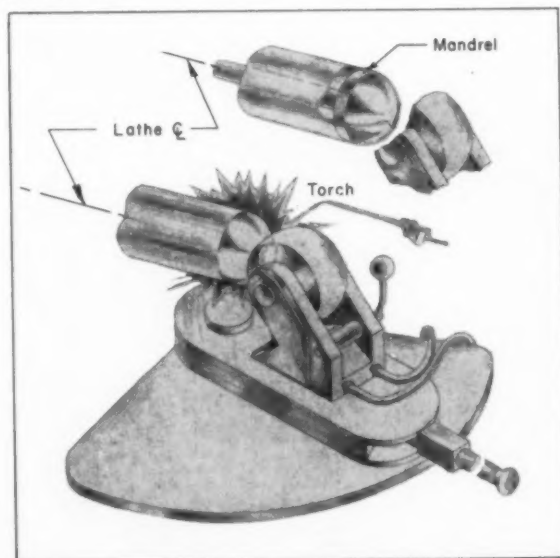
The basic spinning lathe can be used for all types of spinning with the accessories and attachments available or made up especially for certain jobs. In some instances, spinning of noncircular parts for example, the lathe is altered.

**Rollers:** Rollers are made in a variety of shapes and are used primarily for the drawing operations of beading and tube sizing, and in flame spinning.

Selection of the roller is determined by the geometry of the part. They are mounted in a special yoke attached to the cross slide and their movement is controlled through the handwheels. Rollers made of 4130 steel should be heat treated to Rockwell 58-60, and all contact points should be finished to 40 microinches, rms.

**Hand Tools:** Usually, hand tools are the property of the individual spinner. They vary in shape and usage from spinner to spinner. Basically, such tools are individually made and include forming tools with tips of brass, steel or wood. Cutoff or

Fig. 10. After heating a tube end to about 1200 F, it can be closed by this free-wheeling roller swung in a preset arc.



**Table 3—Tube Swaging Limits for Aluminum and Copper**  
(All dimensions in inches)

Aluminum (35-0, 525-0, 615-0, 245-0) Ann. Copper									
0.020 to 0.060 Wall Thickness									
Nominal OD	2	1 7/8	1 3/4	1 1/4	1	7/8	3/4	5/8	1/2
Minimum Swage OD	1 3/8	1 3/8	1 1/4	3/4	1/2	1/2	3/8	3/8	1/4

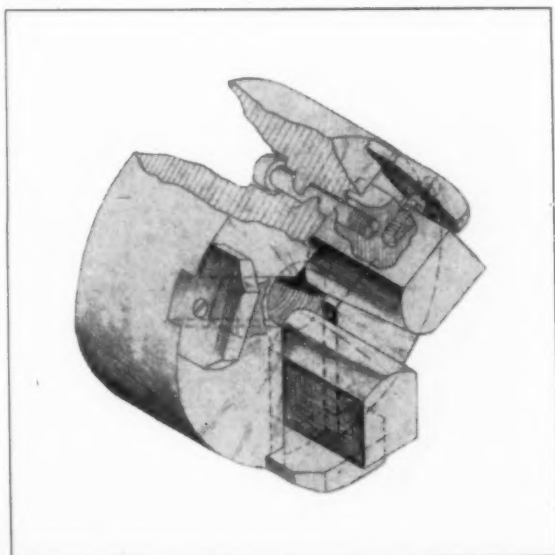
**Table 4—Tube Swaging Limits for Stainless Steel**  
(All dimension in inches)

Stainless Steel (302, 321, 347)							
Nominal OD	Minimum Swage OD by Wall Thickness						
	0.016	0.020	0.028	0.035	0.042	0.049	0.058
1 1/2	1 1/4	1 1/4	1 1/4	1 1/8	1 1/8	1 1/4	1 3/8
1 1/4	15/16	15/16	1	7/8	7/8	1	1
1	11/16	3/4	3/4	5/8	5/8	3/4	3/4
3/4	5/8	5/8	5/8	9/16	9/16	11/16	11/16
1/2	3/8	3/8	5/16	5/16	5/16	3/8	3/8
1/4	1/8	1/8	1/8	1/8	1/8	1/8	1/8

parting tools have carbide, diamond or tool-steel tips.

**Tube Closing:** For closing tubes, the tube is held in a three-jaw universal chuck and is torch heated while being rotated. When the tube end reaches approximately 1200 F, the closing and fusing is accomplished by swinging a free-wheeling roller, Fig. 10, in a preset arc. Supporting mandrels must be used in tubes having wall thicknesses less

**Fig. 11.** Segmented tube swaging attachment can reduce tube diameter to the limits shown in Tables 3 and 4.



than 0.125 inch. Steel tubing up to 6 inches in diameter is easily closed, and the length of tubing that can be closed is determined by the lathe.

Through use of another special attachment, all tubing can be flared at the end to a maximum angle of 45 degrees.

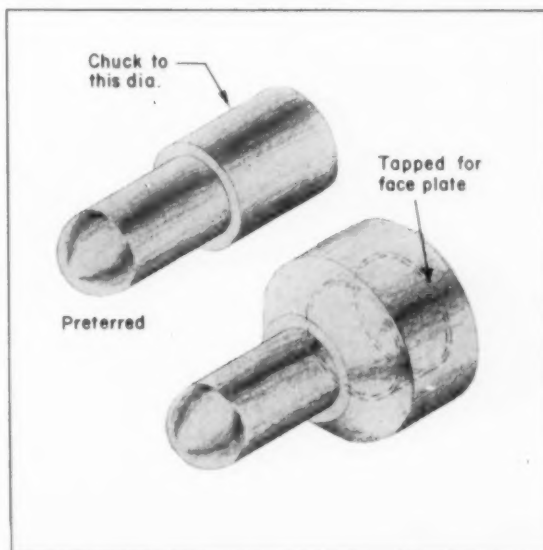
**Tube Swaging:** By standardizing the transition taper angle to 10 degrees and fabricating the swaging dies as adjustable segments, Fig. 11, the tube swaging limits shown in TABLES 3 and 4 can be obtained with one set of dies.

**Chucks:** Three-jaw universal chucks are used to hold steel tubing while the ends are being closed as well as certain types of steel spin blocks. Blocks that fall into this category are turned with a shank for gripping rather than tapped for the faceplate spud. Comparison of the two spin blocks in Fig. 12 shows how much machine time can be saved by designing such blocks for chucking rather than mounting on a faceplate.

**Lubricants:** As in deep drawing, lubricants are essential in the spinning operation. They should be selected to provide proper lubrication, to insure ease in cleaning and to protect against corrosion. Selecting lubricants to prevent corrosion is especially important when spinning aluminum and magnesium.

Petrolated Vaseline is used with aluminum alloys, copper and brass. Fels Naptha soap can be used with all types of steel and Vegin is used with magnesium. Silver and gold can be lubricated with beef tallow, and Johnson's Spin Wax #140 can be used on aluminum and steel.

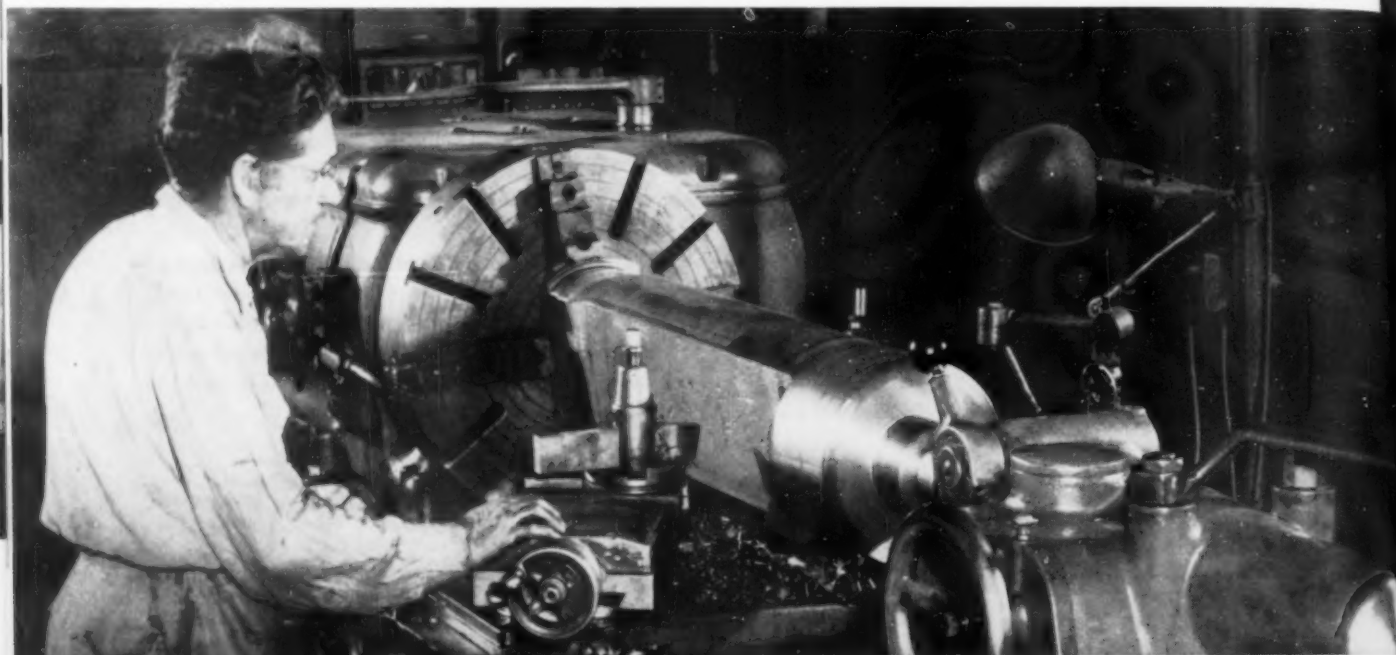
**Fig. 12.** Because of the reduced amount of machining required to produce it, the top spin block is preferred. It is chucked instead of mounted on a faceplate.



# TOOLS at work

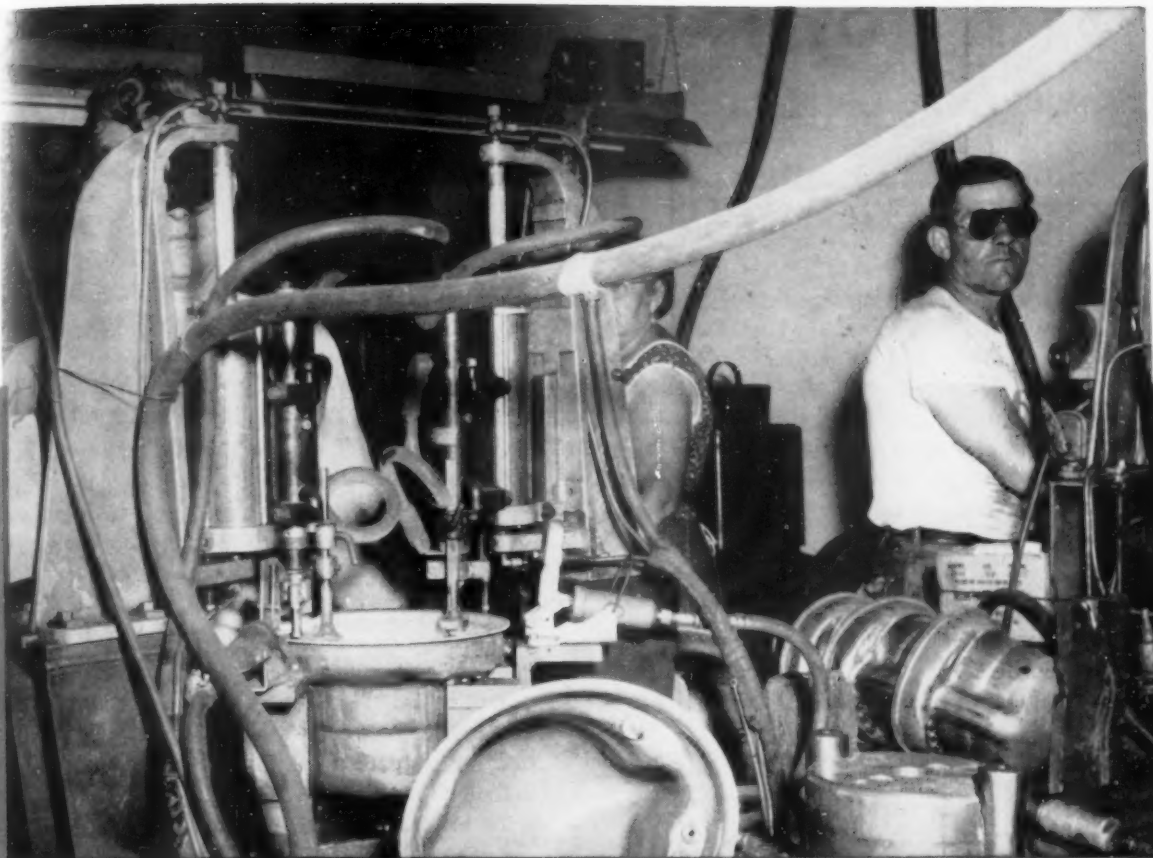
**JUMP CUT TURNING** a rough forging of chrome-moly steel at The Byron Jackson Co., Los Angeles, Calif. The tough (311 Brinell) workpiece, shank of a 300-ton capacity hook for oil drilling equipment, 53 inches long and 12 inches diameter must be turned to 10.5 inches OD and beveled or necked down from 12-inch rough forged diameter to 4.5-inch diameter on the chucked end. Scale of about 1/32-inch depth, plus severe interrupted cutting over the flats makes it a difficult operation.

—Photos courtesy Kennametal, Inc.



**Inset**—a standard brazed carbide tool was converted to a shear angle tool with only slight modification. First the original 15-deg lead angle was increased to 17 deg and a new radius was ground along width of blank. The tool is set on its side for a 17-deg negative back rake and 7-deg positive side rake. The tool post is turned for a 10-deg lead angle. The job is run at 207 SFM with 0.033-inch feed and a cut of 1/8 to 3/8 inch.

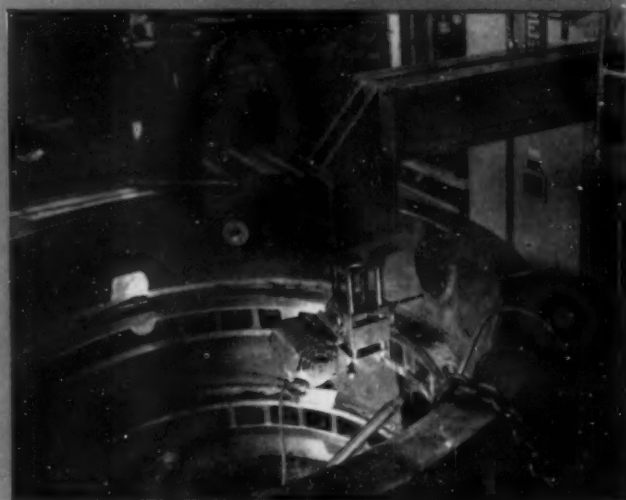
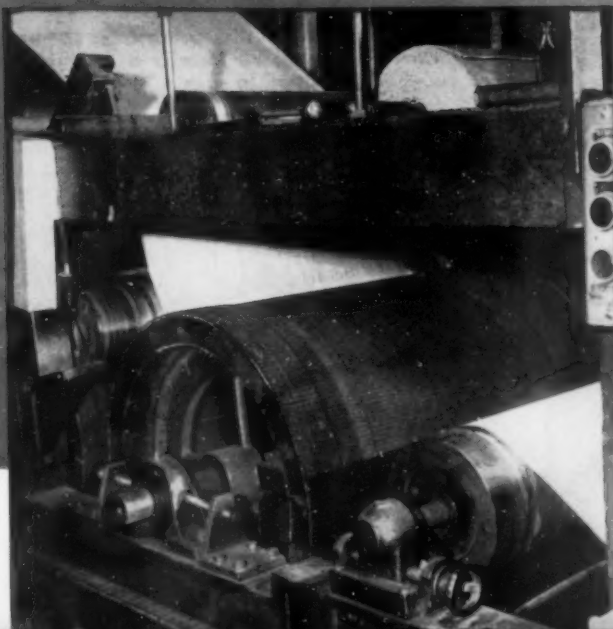




—Photo courtesy Nelson Stud Welding, Lorain, Ohio

**SEMI-AUTOMATIC** stud welding operation at Bingham Stamping, Toledo, Ohio. The new method increased output of air conditioning compressor housings from 30 to 192 units per hour, cut direct fastening costs 30 percent, eliminating warpage, location and alignment problems, and improved quality. Two studs are welded simultaneously by the machine. After the operator loads the guns and places a workpiece in fixture the operation is automatic. Parts were formerly are welded by hand.

**UNUSUAL USE** for rubber conveyor belt (below) is this application as covering for tensioning rolls in coated abrasives plant of Behr-Manning. Ordinarily found in continuous package conveyors the nonslip characteristic of the Thermoid belting was found ideal for this purpose. The rollers control movement of the abrasive stock as it passes continuously from backing to drying processes.



**BACK DRILLING** (above) cast pump case at National Supply Co. plant at Torrence, Calif., before tapping. A master lathe converter is used with a special underarm support and hanger on a G & L floor type horizontal boring machine. Drill speed is 60 rpm and feed is 0.010 ipr.

# PROCESS ANALYSIS

## by Control Charts

By Martin H. Saltz

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OF THE VARIOUS CONTROL CHARTS developed for application in industry the average and range type is probably most widely used. The reason is that this  $\bar{X}$  ( $\bar{X}$  bar) &  $R$  chart serves as a sensitive statistical tool for the analysis of a production process. As such it offers a direct means of improving efficiency and cutting manufacturing costs.

Production men are well acquainted with the fact that no two parts produced by an operation or process are exactly alike. The value of the  $\bar{X}$  &  $R$  chart lies in the fact that it distinguishes between chance causes of variation that are unimportant and assignable causes of variation that should be eliminated to stabilize the process. Assignable causes are attributable to particular factors such as abnormal tool wear, change in stock, change in tooling and errors in inspection.

### Development

The  $\bar{X}$  and  $R$  chart is a practical application of the normal distribution of statistics. If one dimension of all the parts of a production run of 1000 is measured and the parts grouped accordingly, a histogram, Fig. 1, results. The smooth curve fitted to it represents the normal distribution.

As long as the extremes of this normal curve fall within the tolerance or specifications, then the process is suited to the job. This distribution can vary in two ways. The peak or central tendency can shift either towards the high dimension or towards the low dimension, Fig. 2. (color lines). The spread of the curve may become narrower or wider, Fig. 2.

In this illustration the histogram and curves were plotted from a completed production run. In practice, it is desirable to have information about process variations available during the run so corrective action can be carried out as needed. Also, it

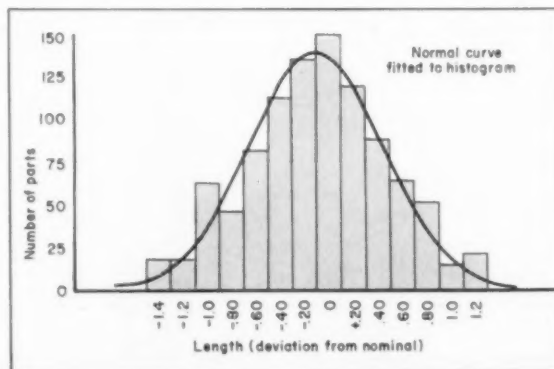
is desirable to eliminate the requirement that the distribution be normal as the shape of the curve cannot be ascertained, until after production is well under way. To accomplish these two things, production samples are taken instead of measuring each individual part.

To have a complete picture of the process and any changes that are taking place, it is necessary to record changes in either the central tendency (average) or the spread of the distribution.

The most common measure of central tendency is the arithmetic mean, or average. This, designated by  $\bar{X}$ , is equal to the sum of the measurements in each sample size divided by the number of measurements. A plot of the averages is used to indicate changes in the central tendency of the distribution. If a trend develops in the averages, it will be an indication that a shift is taking place in the central tendency of the original process, Fig. 2.

The most accurate measure of the spread of a distribution is the standard deviation, sigma ( $\sigma$ ),

Fig. 1. Parts grouped by a dimension form the histogram outlined by the bars. Usually a smooth bell-shaped curve can be fitted to such a histogram.



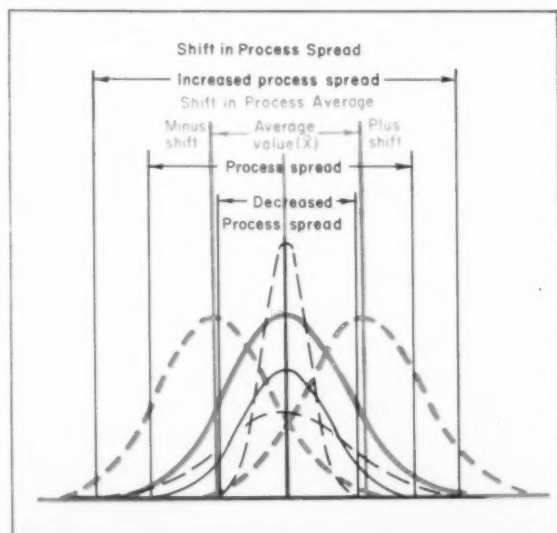
which is equal to the root mean square deviation of the measured values from the average. Because of difficulty in computing the standard deviation another method of measuring spread, namely range, is used. This, designated by  $R$ , is equal to the largest measurement minus the smallest measurement for each sample. Therefore by plotting range variations for samples and comparing these with the average range value, which is a measure of the spread of the original production process, any changes in the value of spread can be recorded, Fig. 2 (color line).

Experience has established that variations in samples up to a measurement of 3 sigma calculated from average range ( $\bar{R}$ ) can be attributed to chance. Beyond that variations are considered assignable. The 3 sigma limits shown in Fig. 3, calculated from the previous definitions, are designated as upper and lower limits. These limits are 99.73 percent accurate. That is, if a value for averages falls outside of these limits it is a true indication of an assignable cause 99.73 percent of the time.

Unlike the distribution of averages of samples, the distribution of ranges of samples is not symmetrical, and the upper and lower control limits will not be symmetrical with the averages of the ranges, Fig. 4.

The transformation from these distributions and limit lines to control charts is a simple one. By turning the distribution sideways as shown in Fig. 5, the upper limit line becomes the upper control limit and the lower limit line becomes the lower control limit for the distribution of averages and for the distribution of ranges of the samples. To further simplify the presentation in the shop, the distribution concept is dropped from the control charts and

Fig. 2. (color) A change in a process average indicates that the nominal dimension to which the work is being performed has shifted. Although a process may operate without a change from the nominal dimension the spread may shift radically as noted above.



only the limit lines and average lines are shown. It is well, however, to keep in mind the derivation.

Basically a typical  $\bar{X}$  &  $R$  chart will consist of four sections, Fig. 6. For special application, such as with reports, the data is often separated from the form plotting the points.

In order to set up an  $\bar{X}$  &  $R$  chart the dimension or characteristic to be investigated must be something that can be actually measured—a dimension, tensile strength, resistance, or other measurable characteristic. One control chart can be used for only a single process. On a multiple spindle or multiple molding machine, each spindle or mold is considered a separate process as one of them can be operating defectively while the rest are operating satisfactorily. Charts may be necessary for each.

It is unnecessary to set up charts on all dimensions and characteristics. But the fact that a specification is loose is no reason for failing to keep control charts. The test is the cost and difficulty of staying within the specification rather than the specification itself.

Before charts are set up a decision must be made as to the size of samples and frequency with which they are to be taken from production. Almost without exception, samples should be made up of con-

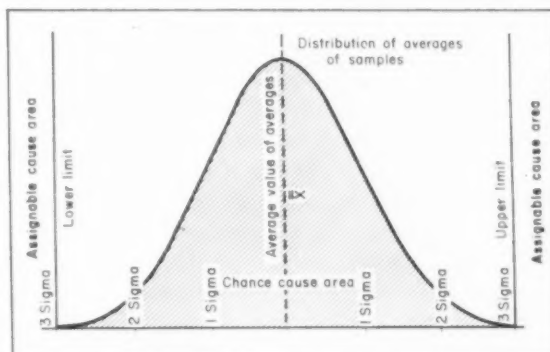
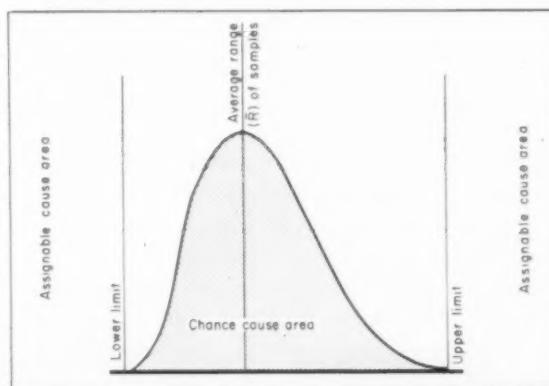


Fig. 3. A normal curve for distribution of averages of samples taken from a production process, with limits set at 3 sigma.

Fig. 4. Distribution of ranges of samples with upper and lower limits set to indicate chance cause area and assignable cause area for variations.



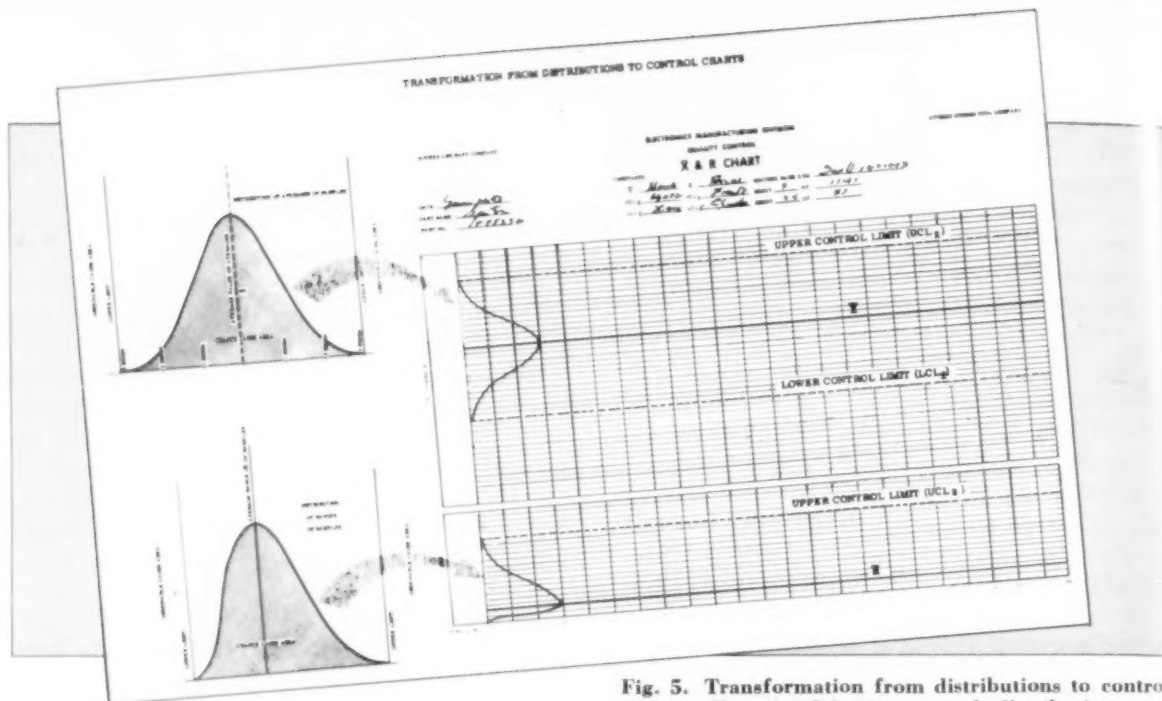


Fig. 5. Transformation from distributions to control charts. For simplification actual distributions are omitted and only control limits based on the distributions are shown.

secutively produced parts. In most applications the sample size is standardized at five, leaving only the interval at which samples should be taken to be decided.

If, in addition to controlling the process the chart is to be used as a basis of acceptance of the part, it is sometimes desirable to take samples of five at random for a certain interval of production rather than five parts produced in sequence. This procedure makes it more likely that the sample will be representative of all parts produced during that period of time.

The frequency of taking samples involves a number of considerations. If there is need to arrive at decisions as soon as possible, then samples should be taken often. If inspection or test costs are high, the frequency should be reduced. In general it is expressed as an interval of time—every hour, every half-hour, every fifteen minutes.

Once the job is set up, the heading of the form is completed to identify the part, process, characteristics being charted, etc., Fig. 6. Then the first step is to withdraw a sample of five from production, measure the dimension and record the measurements, indicating when they were taken, section B, Fig. 6. In the example shown squareness is being measured by total indicator reading (TIR). Calculations are simplified in the case of linear dimensions if only the deviation from nominal is recorded instead of the complete dimension.

After entries are made of the five measurements they are added and averaged, and the result (1.76) entered in the  $\bar{X}$  space provided. The range ( $R$ ) is computed by subtracting the smallest measurement

(1.0) from the largest (2.5). The figure (1.5) is entered in the  $R$  space.

The average and range values are then plotted on the  $\bar{X}$  &  $R$  grids, after first marking off scales based on expected variations in the averages and

Table 1 - Factors for Control Limits

Sample Size	$A_2$	$D_3$	$D_4$
2	1.88	0	3.27
3	1.02	0	2.57
4	0.73	0	2.28
5	0.58	0	2.11
6	0.48	0	2.00
7	0.42	0.08	1.92
8	0.37	0.14	1.86
9	0.34	0.18	1.82
10	0.31	0.22	1.78

ranges. If deviations are charted from a nominal value, as is sometimes done, the scale should provide negative values as well as positive since variation will occur on both high and low side of the nominal figure.

This procedure must be repeated for each sample taken until sufficient data are accumulated for computation of control limits. Until the control limits are established there is no way of knowing whether or not the variations in the process are attributable to assignable causes.

It is advisable to compute control limits on at least ten samples. If possible to wait until more samples have been taken the limits will be more accurate and less revision will be required. Assum-

it is necessary to take action as soon as possible, the limits are established as follows:

- The average of the average values of individual samples is computed. This grand average is indicated as  $\bar{\bar{X}}$ , and for the first ten samples in the example shown becomes 1.92.
- The average for the range values is also taken, and is represented by  $\bar{R}$ . It is calculated as 2.12.
- The upper control limit for  $\bar{X}$  is given by the equation  $UCL = \bar{\bar{X}} + A_2\bar{R}$ .  $A_2$  is a constant equal to 0.58 for a sample of five parts. (For values of  $A_2$  for samples of other sizes see TABLE 1.) Then UCL value for  $\bar{X}$  becomes 3.14.
- The lower control limit for  $\bar{X}$  equals  $\bar{\bar{X}} - A_2\bar{R}$  for samples of five. With  $A_2$  equal to 0.58 the LCL value for  $\bar{X}$  is 0.70.
- The upper control limit for  $R$  equals  $D_4\bar{R}$ . The constant  $D_4$  equals 2.11 for the sample size of five. From the data the UCL for  $R$  is 4.47.
- The lower control limit for  $R$  equals  $D_3\bar{R}$  for samples of five. The constant  $D_3$  is 0 for the sample size, so LCL for  $R$  is 0.
- The values for  $\bar{\bar{X}}$ ,  $\bar{R}$ ,  $UCL_{\bar{X}}$ ,  $LCL_{\bar{X}}$ ,  $UCL_R$ ,  $LCL_R$  are plotted on the control chart.

The completed chart gives a picture of progress of the process. If all points plotted fall within the control limits the process is said to be in statistical control. If any of the points fall outside of any of the control limits, the process is said to be out of control.

The completed control chart, Fig. 6, illustrates a process that is in statistical control on both the  $\bar{X}$  &  $R$  graphs. One hundred-percent inspection is not necessary if a process is in control.

## Interpretation

Other conditions that cause variations in a process often show up in set patterns on a control chart, Fig. 7. Section C is an example of how tool wear appears on a control chart. The  $\bar{X}$  chart has developed an upward trend until finally the process has gone out of control. During this time the range chart has remained in control. With this as a guide it is possible to determine how frequently it is necessary to redress tools and make other adjustments as the work progresses. In this way much down time can be eliminated as it is unnecessary to make adjustments in a process that is producing satisfactory parts and remains in control.

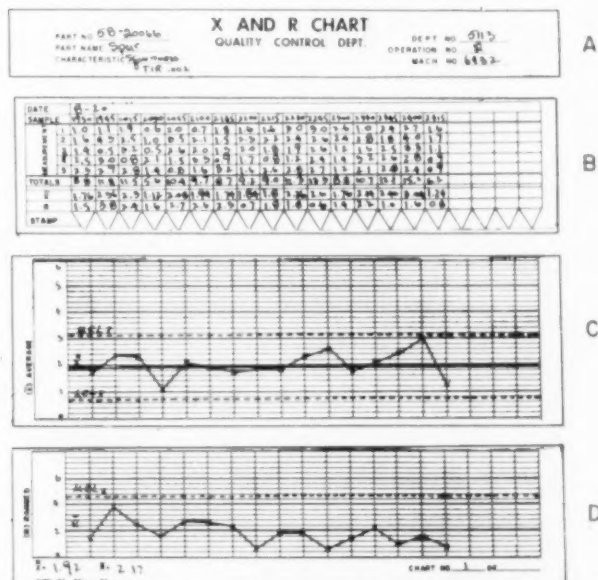
Section A of Fig. 7 is an example of a control chart indicating a sudden change in a process. The change might be due to an unintentional variation in stock, operating speed, or breaking of a tool. It might, in some instances, indicate a mistake on the part of the inspection department in setting a gage or other inspection device. An error of this sort

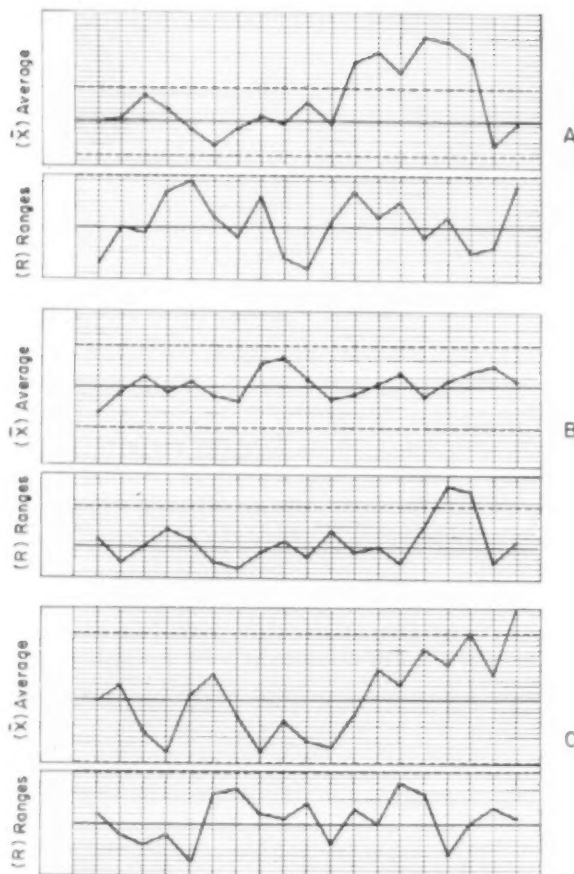
sometimes shows up as an out-of-control point on the low side.

Section B of Fig. 7 shows a process that has remained in control on the  $\bar{X}$  chart but has gone out of control on the range chart. This indicates that although the process is still working to a particular nominal dimension the process is not turning out consistent parts. Such a condition might be due to abnormal wear of tooling or the need of repairs in the machine itself, spent chemical solutions, loose toolholders or the need for other adjustments. These are classic examples of control chart trends. In general, in the interpretation of such a chart it might be well to remember that as long as a process is in control on both the  $\bar{X}$  &  $R$  charts it is not necessary to make adjustments to the machine in an attempt to eliminate some of the variations. Any such attempt would be likely to be futile in that the variations are probably due only to chance factors. When a variation occurs that results in a point going out of control on either the  $\bar{X}$  or the  $R$  charts, however, it is a good indication that an assignable cause has developed and an attempt should be made to find the cause and bring the process back into control.

Other information can be learned about a process from the values of  $\bar{\bar{X}}$  and  $\bar{R}$ . As mentioned previously, production parts usually fall into a pattern or distribution which approximates a normal curve. The width across the base of such a distribution for a process is called the natural spread of the process.

Fig. 6. Typical average and range control chart widely used in industry broken into four component parts.





**Fig. 7. Typical control chart trends.** Such trends follow definite patterns that can be interpreted as noted in the accompanying text, based on past experience, so the cause may be corrected.

spread is always referred to as the upper tolerance limit (UTL) and the lower value of the natural spread is referred to as the lower tolerance limit (LTL). These tolerance limits should not be confused with the tolerance limits as specified in blueprints or specifications. These chart tolerance limits should be somewhat closer than the tolerances called out on the specifications. The upper and lower tolerance limits can be computed by the following formulas:

$$\text{Upper tolerance limit (UTL)} = \bar{X} + 3 \frac{\bar{R}}{d_2}$$

$$\text{Lower tolerance limit (LTL)} = \bar{X} - 3 \frac{\bar{R}}{d_2}$$

Values for the constant  $d_2$  are given in TABLE 2, for each sample size.

The relationship between the specifications called out in the print and the spread tolerance limits are shown in Fig. 8. Various possibilities in the relationship are shown. Depending on the process or operation, desired corrective action may be indicated.

In general, a process or operation can be tightened or loosened. It is economically advantageous to work a process as loose as possible in order to take full advantage of the specification. At the same time it must be set up tight enough to stay within the specification. By calculating the natural spread and comparing it to the specification, it is possible to determine whether or not the process is functioning satisfactorily. If, at the same time, the  $\bar{X}$  value of the distribution is compared with the nominal value of the specification, an indication is obtained of whether or not the process is centered with regard to the specification. These two values in conjunction with each other give a complete picture of the method of operation. It can then be adjusted so that the job will be made as easy as possible.

### Tolerance Limits

In statistical work the upper value of a natural

**Fig. 8. Relationship between spread tolerance and print specifications.** Nominal dimension and spread of the process can be controlled by the operator setting up the job. In *A* proper relationship exists. Natural spread of the process is less than spread allowed and all of the parts will be acceptable. In *B* natural spread is greater than allowed so some of the parts will be rejects. In *C* natural spread is less than allowed but due to poor centering of the process rejects will be produced.

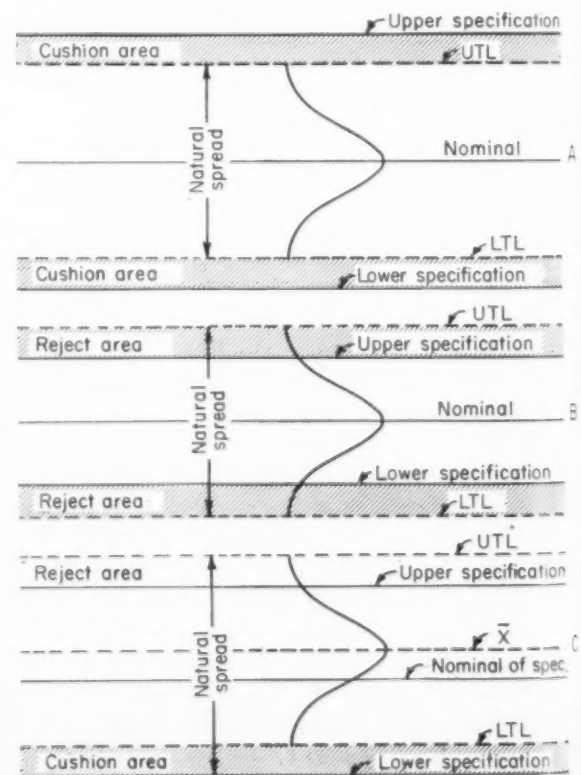


Table 2 - Factors for UTL and LTL

Sample Size	$d_2$
2	1.128
3	1.693
4	2.059
5	2.326
6	2.534
7	2.704
8	2.847
9	2.970
10	3.078

### Limitations

Production personnel may feel that through experience, they have the information that is given

by these computations without going through the steps outlined. Experience has shown, however, that this is not true and that all that is available is a general feeling as to what a process is capable of doing. This information, when it depends on the memory of the operators is often misleading and in error.

The  $\bar{X}$  & R control chart finds wide application and is sensitive to changes in a process. It is restricted in that it is only applicable to those operations where the inspection is performed by variables, i.e., where the characteristic is actually being measured in some way. In addition, it is generally impractical, because of the expense involved, to maintain control charts on all processes and operations especially where a multitude of specifications are involved for each.

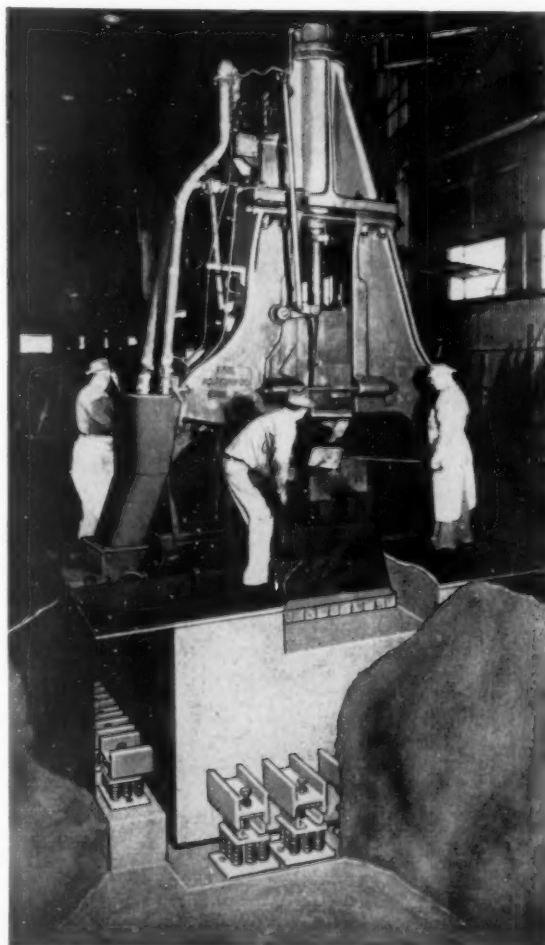
## Stopping Big Machinery "Shakes"

NUMEROUS COMPANIES have effectively lost investment as well as precious working time due, not to breakdown, but to the fact that a large, expensive piece of machinery proved to cause so much vibration that nearby machinery was rendered practically useless during its operation.

At the Earle M. Jorgensen Co.'s Forge Div. a 3000-pound ram, double-frame steam hammer created such a problem. It stood idle for three years because each hammer stroke caused tremors that could be felt over a 500 to 700 foot radius. High water content in the sub-soil under the plant transmitted shock and vibration to a very high degree. Efficiency of delicate machinery in the vicinity was upset, and periodic shakings made it evident that even neighboring buildings would eventually be damaged.

The hammer was a white elephant until the Korfund Co., Inc., specialists in vibration control were consulted. Following study of the problem, the recommendation of replacing the existing foundation with one supported on specially designed steel-spring units was carried out. As proof of the elimination of vibration, a nickel placed on edge near the hammer will remain standing through the unit's operation.

Here the artist has revealed the deeply buried steel spring supports which effectively removed the vibration problem resulting from operation of this equipment.



# How to Compute ANGULAR TOLERANCES

## with a slide rule

By Abraham Stein\*

Process Engineer  
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**C**ALCULATION OF TOLERANCES for basic dimensions that are related by angular position and obtained indirectly is usually tedious when done by conventional trigonometric methods. Effort and time expended for such calculations can be drastically reduced through the use of approximate formulas and a slide rule. The formulas presented in this article are derived through the use of calculus, and, though approximate, they yield results to more decimal places of accuracy than required for precision machine work.

### Right Triangles

The formula relating the sides of any right triangle, Fig. 1, is expressed as:

$$C(\pm e_C) + B(\pm e_B) + A(\pm e_A) \approx 0 \dots \dots \dots (1)$$

where  $A$  and  $B$  are legs, and  $C$  is the hypotenuse of the triangle,  $e_A$ ,  $e_B$  and  $e_C$  are tolerances of their respective sides, and the right angle does not vary.

When transposing terms of Formula 1 to solve for any one of the unknown tolerances (errors), it is important to choose those signs, positive or negative, that will give the unknown tolerance its maximum value. The following formulas, derived from Formula 1, indicate correct choice of sign:

$$e_C \approx \frac{A(e_A) + B(e_B)}{C} \dots \dots \dots (2)$$

$$e_B \approx \frac{A(e_A) + C(e_C)}{B} \dots \dots \dots (3)$$

$$e_A \approx \frac{C(e_C) + B(e_B)}{A} \dots \dots \dots (4)$$

\*Senior member ASTE, New York chapter.

As an example of the use of these formulas, consider the situation shown in Fig. 2. It is required, with a jig borer, to produce three holes in a plate and maintain the  $2.0000 \pm 0.0005$  dimension by controlling the unknown tolerances of the  $1.73205$

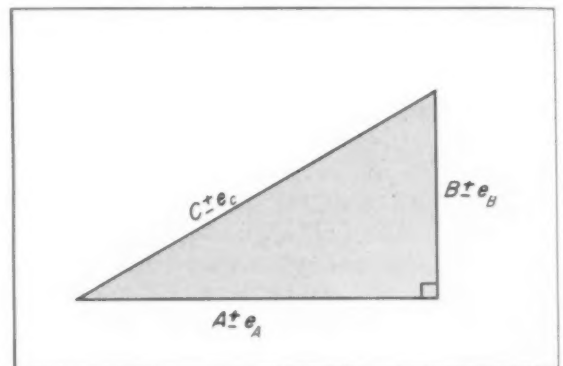
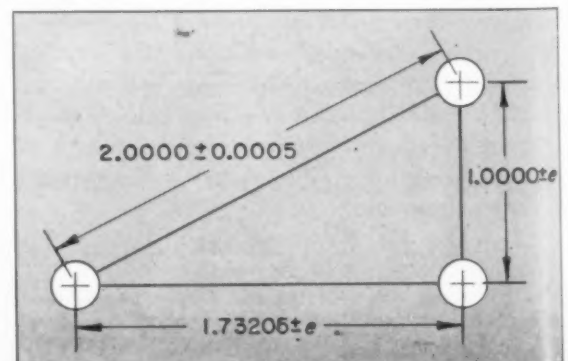


Fig. 1. Dimension and tolerance symbols for right triangle.

Fig. 2. Steel plate to be jig bored with three holes that form a right triangle when their centers are joined.



as 1.0000 dimensions.

In this problem, the unknown error is assigned equally to the leg dimensions. Conventional methods of solving this problem would result in the equation:

$$(1.0000 + e)^2 + (1.73205 + e)^2 = (2.0005)^2$$

where  $e$  is the permissible error. Solving this equation for  $e$  involves algebraic manipulation and extraction of a square root to many decimal places.

This problem is greatly simplified through use of a slide rule and Formula 1, with  $e_A$  and  $e_B$  equal to  $e$ :

$$C(e_C) + (B + A)(e) \approx 0$$

$$e \approx \frac{(2.0000)(0.0005)}{1.0000 + 1.732}$$

$$e \approx 0.000366$$

Calculation of the true error by conventional methods results in a value for  $e$  of 0.000367. The difference of 0.000001 is negligible in jig borer practice.

**Angular Tolerances:** Approximate formulas also can establish relationships between angular tolerances and the tolerances of two sides of right triangles. Based on the general conditions shown in Fig. 3, these formulas are:

$$\sin e_\theta \approx \frac{C(\pm e_A) + A(\pm e_C)}{C^2 \cos \theta} \dots \dots \dots (5)$$

$$\sin e_\theta \approx \frac{C(\pm e_B) + B(\pm e_C)}{C^2 \sin \theta} \dots \dots \dots (6)$$

$$\sin e_\theta \approx \frac{[A(\pm e_B) + B(\pm e_A)] \cos^2 \theta}{B^2} \dots \dots \dots (7)$$

where  $\theta$  is the angle in degrees and  $e_\theta$  is the angular tolerance in degrees. Signs, positive or negative, for the tolerances in Formulas 5, 6 and 7 are taken so the unknown tolerance will be maximum.

As an illustration of the use of these formulas, suppose that it is necessary to calculate the tolerance that must be applied to the 0.5000 leg of the triangle shown in Fig. 4, if the tolerances for the

angle and the hypotenuse are known. Transposing terms in Formula 5 and solving:

$$e_A \approx \frac{(\sin e_\theta)(C^2)(\cos \theta) - A(\pm e_C)}{C}$$

$$\approx \frac{0.00029(1^2)(0.866) - (0.5)(-0.001)}{1}$$

$$e_A \approx 0.000751$$

The answer to this problem by conventional methods is 0.000750. The difference of 0.000001 is negligible.

## General Triangles

Labor saving, approximate formulas can also be applied to general triangles with good results. A formula for the tolerance relationships of the sides and one of the angles of a triangle, Fig. 5, is:

$$A(\pm e_A) + (B - C \cos \alpha)(\pm e_B) + (C - B \cos \alpha)(\pm e_C) + BC(\sin \alpha)(\pm \sin e_\alpha) = 0 \dots \dots \dots (8)$$

When using this formula, signs should be chosen to make the unknown tolerance a maximum. Also, standard trigonometric sign conventions should be observed. If angles are larger than 90 degrees, the cosines are negative and are substituted as such in Formula 8.

If it is desired to know, for example, what toler-

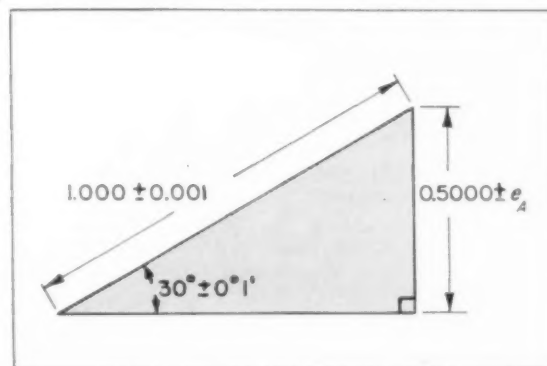


Fig. 4. Illustrative example for use of angular tolerance relation formula.

Fig. 3. Dimension and tolerance symbols for relating angular tolerance in right triangle.

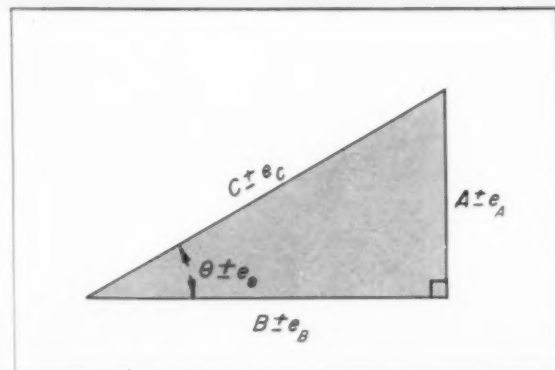
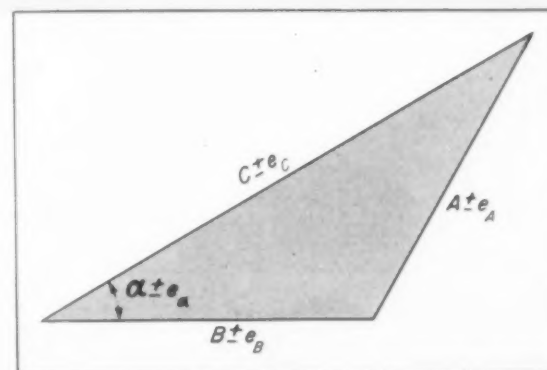


Fig. 5. Dimension and tolerance symbols for general triangle.



ance the 1.0000 side of the triangle, Fig. 6, will have when tolerances are assigned to the other sides and their included angle, Formula 8 can be used:

$$e_A = \frac{(B-C \cos \alpha)(\pm e_B) + (C-B \cos \alpha)(\pm e_C)}{A} + \frac{BC \sin \alpha (\pm \sin e_\alpha)}{A}$$

$$e_A = \frac{[1.414 - 1.932(0.866)](-0.005)}{1} + \frac{[1.932 - 1.414(0.866)](0.010)}{1} + \frac{(1.414)(1.932)(0.5)(0.0175)}{1}$$

$$e_A \approx 0.0319$$

The true value determined by standard procedure is 0.0321, a difference of 0.0002.

This problem illustrates an additional advantage associated with the approximate formulas. With conventional methods it is not always apparent whether the positive or negative value of each component tolerance will cause a maximum variation for the unknown tolerance. Proper signs can be determined by inspection when the approximate formula is used.

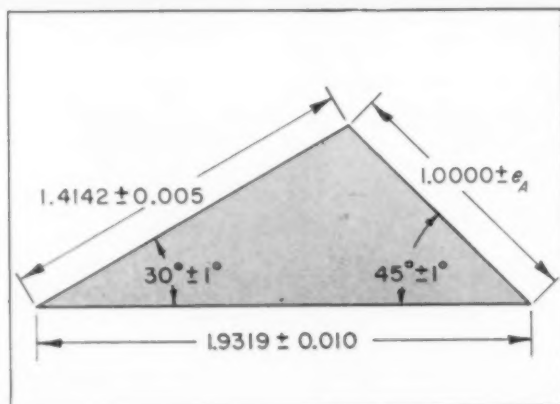
A useful approximate formula for the relationship of the tolerances of two sides of a general triangle to their opposite angles, Fig. 7, is:

$$\sin \beta (\pm e_A) + B \cos \alpha (\pm \sin e_\alpha) + B \sin \alpha (\pm e_B) + B \sin \alpha \cot \beta (\pm \sin e_B) \approx 0, \dots, (9)$$

Fig. 6. (below) Sample problem showing use of general triangle formula.

Fig. 7. (top right) Dimension and tolerance symbols for general triangle for use with formula relating sides and opposite angles.

Fig. 8. (lower right) Sample problem for which formula relating tolerance of sides and opposite angles is used.



Formula 9 is used if it is desired to calculate the tolerance on the 0.8150 side, Fig. 8, that results from the tolerances shown for the other angle and side. By transposing terms:

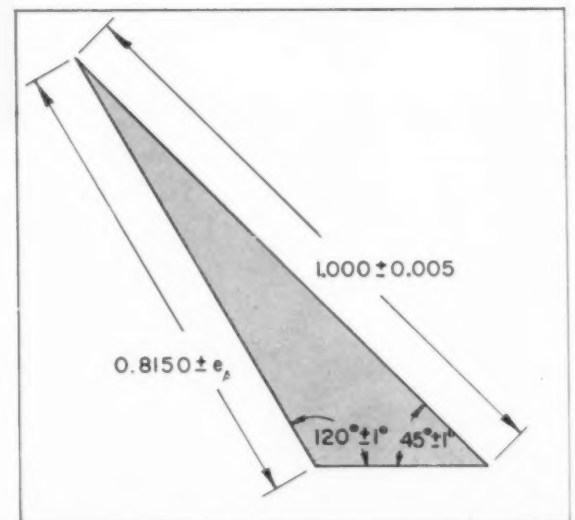
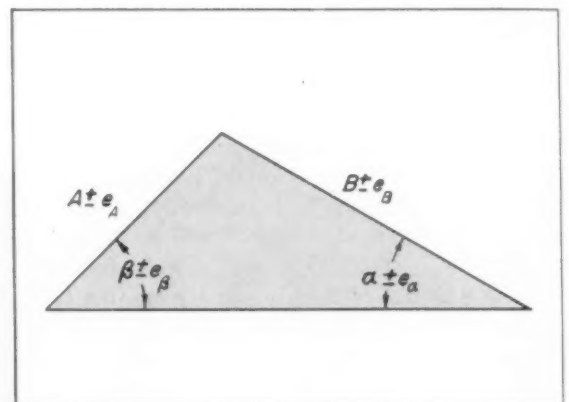
$$e_A \approx \frac{B}{\sin \beta} \cos \alpha (\pm \sin e_\alpha) + \frac{B}{\sin \beta} \sin \alpha (\pm e_B) + \frac{B}{\sin \beta} \sin \alpha \cot \beta (\pm \sin e_B)$$

$$e_A \approx \frac{1.000}{0.866} (0.707) (0.0175) + \frac{1.000}{0.866} (0.707) (0.005) + \frac{1.000}{0.866} (0.707) (0.576) (0.0175)$$

$$e_A \approx 0.0267$$

The true value of the maximum tolerance is 0.0283. The difference is 0.0016. Although this difference is large, it is negligible in cases such as this where the tolerance itself is large.

All triangular tolerance problems can be solved with the formulas presented in this article. A formula is chosen to suit the conditions of the problem and the known values are substituted in it. Since calculations on a slide rule are accurate to three or four significant figures, no more than this number of significant figures are used for an individual quantity.



# Titanium

## How to deep draw it

By **Carter C. Higgins**

President and General Manager  
Worcester Pressed Steel Co.  
Worcester, Mass.

SINCE PROPERTIES of titanium complement those of commercially available materials and fill the gap between those of aluminum and steel, much effort is being expended to determine how to work the metal and its alloys. In addition, problems of ore refinement, ingot production, alloy standardization and cost reduction must be solved before titanium can be classed as a commercially useful engineering material. Titanium currently costs about \$20 per pound in sheet form.

Below approximately 1600 F titanium is a hexagonal close-packed crystalline system but above this temperature it transforms into a body-centered cubic structure. The hexagonal crystal structure resists severe deformation and has low ductility but forming or upsetting is relatively easy.

When alloyed, the strength of titanium can be increased. Annealed yield strength of titanium and its alloys ranges between 40,000 and 130,000 psi. Cold working increases the yield and tensile strengths; and the metal work hardens rapidly. Titanium loses strength and becomes embrittled when continuously exposed to temperatures above 1000 F, although its melting point is 3150 F. Unless cold worked or alloyed, the metal has a tendency to creep under constant static loading.

Because of the newness of the metal and its potential uses where light weight and high temperature and corrosion resistance are needed, a research program into the stamping and drawing characteristics

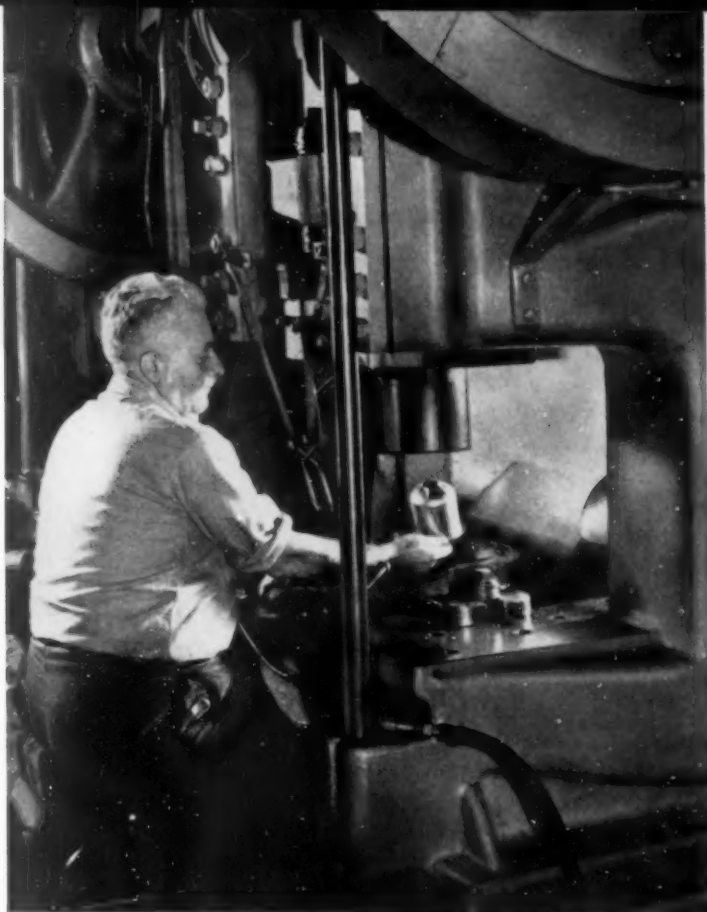


Fig. 1. Titanium cups are deep drawn on a large press with dies formerly used for steel parts.

of titanium was started in 1950 by Worcester Pressed Steel Co. The first material investigated was commercially pure (99.5 percent) titanium sheet and tests were run on existing tools, Fig. 1, of conventional design that had originally been used to deep draw steel. Since then, various alloys have also been studied.

From the outset, it was found that commercially pure metal can be drawn at room temperatures with fairly good results. One alloy investigated is apparently drawable only at elevated temperatures. All alloys of titanium—commercially pure titanium is in effect an alloy—harden so rapidly under cold working that stresses must be relieved after each draw to restore ductility necessary for subsequent forming operations. Cold working effects can be removed by annealing at about 1300 F for periods the length of which depends on the gage. For 0.010-in. material, two minutes at 1325 F is sufficient; while seven minutes at the same temperature is required by material 0.078-in. thick.

Initial reductions of 40 to 45 percent from blank diameter to cup diameter, Figs. 2 and 3, have been made at room temperature. Successive redraws, after annealing, achieved further reductions of 15 to 25 percent.

By far the biggest obstacle to successful drawing of the metal stems from the friction characteristics

of titanium—its tendency to gall and seize. As it passes over tool surfaces during plastic flow, titanium particles are picked up by tool marks, pits, scratches and other irregularities. These cause scoring of the sidewall of the work and roughening of the die. In subsequent runs, conditions get progressively worse and metal begins to build up on the die. Ultimately, seizure occurs and the workpiece ruptures.

The tendency to gall is further aggravated by the



**Fig. 2.** Titanium RC70 can be drawn into cups  $1\frac{1}{16}$  in. deep with a diameter of  $1\frac{3}{8}$  in. from 0.025-in. gage sheet. Stress relieved and redrawn twice, final dimensions of the cup are  $1\frac{5}{16}$  in. deep by  $1\frac{3}{16}$  in. in diameter.



**Fig. 3.** Oil filter cases can be successfully deep drawn of TI 75A by successive press operations if stress relieved at 1325 F for seven minutes and air cooled after each step.

high drawing pressures required for titanium blanks. These pressures are much greater than those used for shaping mild steel and are comparable in magnitude to pressures used on stainless steel.

To overcome frictional properties of titanium, proper die lubrication is mandatory. While an entirely satisfactory procedure for overcoming seizure when drawing titanium has not yet been found, several methods show promise. Dry film lubricants are somewhat successful in maintaining adequate lubrication between the sliding surfaces. Bonderizing before applying the lubricant gives even better results.

Other chemical treatments, such as anodizing, have proved helpful too. In some instances, polishing dies to a high finish also helps prevent scoring and seizing. Electrolytically formed coatings and copper plating of the blanks have been tried, but much research must still be done on this problem. Tools designed for drawing stainless steel were tried with the hope that dies made of a bronze alloy might prevent seizing, but without success. Results were about the same when tool steel dies were used and chromium-plated dies were equally unsuccessful. Sintered carbide tools have less tendency to scratch and gall than do bronze, tool steel or chromium-plated dies.

Titanium is sensitive to the rate of deep drawing and forming cannot be hurried. Successful drawn parts are usually run at about  $\frac{1}{2}$  to  $\frac{2}{3}$  the speed recommended for mild steel parts.

Initial investigations into titanium drawing have turned up many valuable facts but of even more importance, avenues requiring further experimentation and research have been indicated. There is still much to learn about drawing speeds, pressures, clearances, optimum draw radii, tool design, setup methods and die lubrication.

Some of these problems will be more easily solved when the technology of obtaining pure titanium is advanced. Industry efforts to standardize alloy compounds will probably result in more uniform compositions and freedom from defects, thus speeding drawing operations, reducing breakage and lowering the present high cost of drawing. Since titanium's properties depend to a large extent on impurities in the metal, improved quality and consistent properties from batch to batch will aid future deep drawing studies.

A contract, recently awarded by the Ordnance Corps, Department of the Army, specifies an investigation into the forming properties of pure titanium and its alloys in a variety of gages. Tests will be conducted at many different temperature levels and rates of drawing. There are already indications that drawing at higher temperatures will avoid some of the difficulties that have been encountered at room temperature.

# press forging

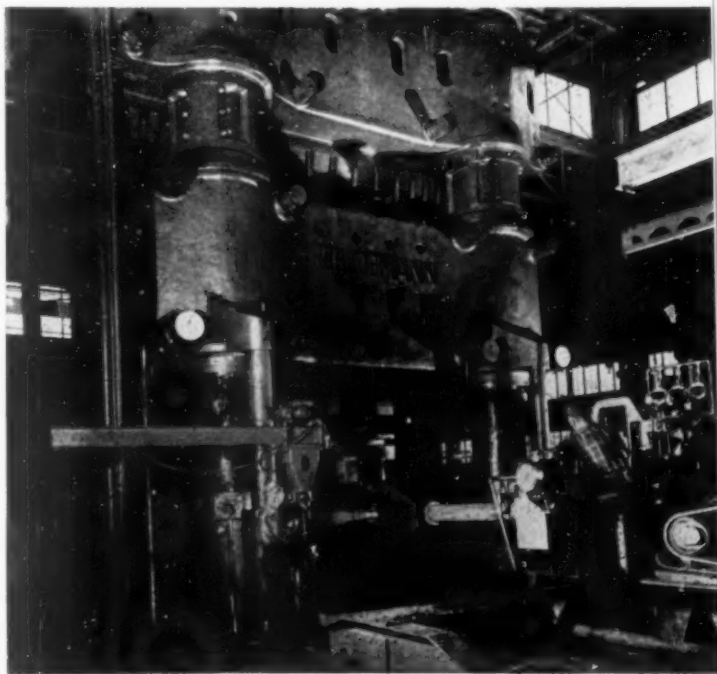
by **Ralph H. Eshelman**  
Associate Editor

**B**ECAUSE PRESS FORGING OPERATIONS are more easily systematized than those for drop forging, the process has been growing rapidly both in favor and in importance. Until recent years, presses for forging were limited in size. Also, adequate production knowledge was not available and there was a general feeling that quality of parts was inferior to that of other forgings.

As production requirements increase, the advantages of the press method become more evident, especially in costs. Since it has been demonstrated that there is no apparent difference between press and drop forgings, the choice of method depends upon other factors such as availability of equipment, length of run, skilled labor supply, etc. With some notable exceptions it is probable that the bulk of steel forgings, however, will continue to be made in drop hammers, especially in job lots are involved.

Forging by mechanical presses is largely limited at present to relatively small parts and nonferrous alloy pieces under 30 pounds. Conventional crank press types are usual with the mechanism powered by a motor-driven flywheel transmitting energy during each blow. The stroke and force of the blow remain constant. The operator merely places

the stock in the die and trips the starting mechanism. In contrast to smith and drop forging, which depend more upon operator skill, greater importance is placed upon correct tooling setup. Since speed of the operation can be high, mechanical presses are ideally suited to high volume production that



**Fig. 1. Mechanically inserting preheated aluminum stock into die of 15,000 metric ton forging press at the Cleveland Works of Aluminum Co. of America.**

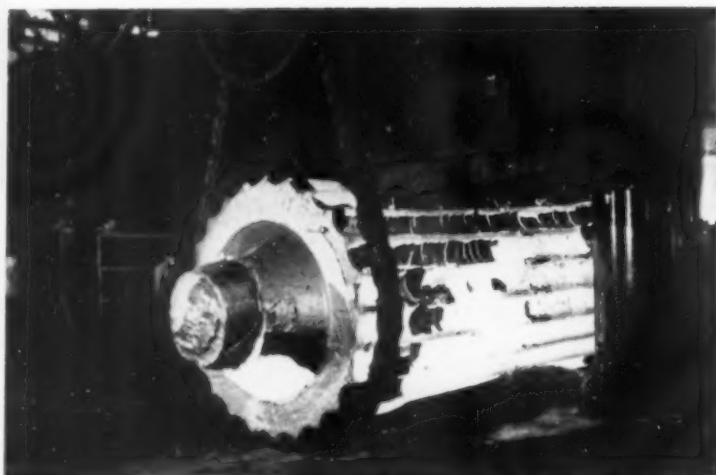


Fig. 2. First forging heat in 7500-ton press at Bethlehem Steel Co. A 275-ton ingot is being forged to rectangular shape. The part is a press column brought to a final length of 110 feet in several stages.

justifies expense of precision tooling.

Range in capacities of mechanical presses runs between a few hundred tons and 2500 tons. They are best adapted to relatively simple shapes that do not require complex preforming.

The hydraulic press, Fig. 1, has become a major piece of production equipment, especially for aluminum and magnesium aircraft fittings and components. Capacities of such presses have been constantly extended to meet greater demands of airplane designers, and range in size from a few hundred tons to 35,000 tons with even larger ones projected. In fact, the heavy-press program of the Air Force has revolutionized thinking in the forging field in size and kind of parts, as well as ultimate pressures to be attained.

Unlike forging in hammers using repeated impact blows or mechanical presses in which impact is combined with squeezing, hydraulic presses operate entirely with squeezing force. It is applied continuously, usually with increasing intensity as the metal continues to flow.

This type of equipment is especially well suited to breaking down large ingots in open dies preparatory to other forging operations or subsequent forming, Fig. 2. It is also suitable for smith forging large shafts, rings, gear blanks or blocking forgings to be machined to shape when smaller quantities fail to justify expense of closed impression dies. Because of the long stroke and great power of hydraulic presses they are used extensively for heavy, hollow forgings such as pistons for large diesel engines. Die life is greatly extended by elimination of impact effects. This is extremely

important when continuity of deliveries of large forgings must be maintained and where cost and time of die replacements would be considerable.

The hydraulic press is necessary for production of many magnesium forgings as some of these alloys do not lend themselves to hammer or mechanical press operations.

### Mechanical Press Forging

Production of bronze, copper and brass forgings has grown rapidly since shortly before the beginning of World War II. In 1945, for instance, tonnage was five times the average for the five-year period from 1935 to 1939. The popularity of non-ferrous forgings stems from the wide range of possibilities for economically producing complicated and irregularly shaped metal parts and intricate fittings such as for fuses, valves, gages, meters, etc. Grain structure is uniform and dense. High tensile strengths are secured which often permit reductions in weights of parts previously produced by casting or other methods.

Because of the accuracy and smooth finish attained few machining operations are required and these may be performed at maximum speed due to free-turning qualities and absence of impurities or irregularities.

Many copper-base alloys are adaptable to forging and have been successfully used. Characteristic properties of those commonly forged are shown in

	Forging Types						Thin Section, Short, (up to 6 in. long)	Thin Section, Long, (6 in. to 10 in. long)
	Solid	Solid with Symmetrical Cavity	Solid with Eccentric Cavity	Solid, Deep Extrusion	Hollow, Deep Extrusion			
Copper	0.010	0.010	0.012	0.012	0.012	0.012		0.01
Muntz Metal	0.008	0.008	0.008	0.010	0.010	0.010		0.01
Forging Brass	0.008	0.008	0.008	0.010	0.010	0.010		0.01
Naval Brass	0.008	0.008	0.008	0.010	0.010	0.010		0.01
Leaded Naval Brass	0.008	0.008	0.008	0.010	0.010	0.010		0.01
Manganese Bronze	0.008	0.008	0.008	0.010	0.010	0.010		0.01
High Silicon Bronze	0.012	0.012	0.012	0.014	0.014	0.014		0.0
Aluminum Silicon Bronze	0.010	0.010	0.012	0.012	0.012	0.012		0.0
Nickel Silver 45-10	0.008	0.008	0.008	0.010	0.010	0.010		0.0

# drop forging

Table 1—Characteristic Properties of Hot Pressed Forgings\*, Copper and Copper-base Alloys

Material	Composition (percent)	Relative Forgeability† (percent)	Hot Working	Soft Soldering	Brazing	Gas	Welding Carbon Arc	Resistance	Machinability* percent	Forging temperature (ave.) F
Electrolytic Tough Pitch Copper	Cu 99.90 Min.	65	Excell't	Excell't	Good	Poor	Fair	Poor	20	1500
Deoxidized Copper	Cu 99.90 Min.	65	Excell't	Excell't	Excell't	Fair	Good	Poor	20	1500
Muntz Metal	Cu 59.0-63.0 Zn Remainder	90	Excell't	Excell't	Good	Good	Fair	Fair	40	1400
Forging Brass	Cu 58.5-62.0 Pb 1.50-2.50 Zn Remainder	100	Excell't	Excell't	Good	Fair	Poor	Poor	80	1400
Naval Brass	Cu 59.0-62.0 Sn 0.50-1.00 Zn Remainder	90	Excell't	Excell't	Good	Good	Fair	Fair	30	1400
Leaded Naval Brass	Cu 59.0-62.0 Sn 0.50-1.00 Pb 1.25-2.25 Zn Remainder	90	Good	Excell't	Good	Fair	Poor	Poor	70	1400
Manganese Bronze	Cu 57.0-60.0 Sn 0.50-1.50 Fe 0.80-2.00 Mn 0.50 Max. Zn Remainder	80	Excell't	Excell't	Good	Good	Fair	Good	30	1400
High-Silicon Bronze	Cu 94.8 Min. Si 2.75-3.50	40	Poor	Good	Good	Excell't	Excell't	Excell't	15	1600
Aluminum Silicon Bronze	(nominal) Cu 91.0 Al 7.0 Si 2.0	75	Fair	Fair	Fair	Fair	Fair	Fair	55	1500
Nickel Silver 45-10	Cu 44.0-46.0 Ni 9.0-11.0 Zn Remainder	85	Excell't	Excell't	Good	Good	Good	Good	40	1400

Note: Since it is impracticable to reduce these variables to common units, calibration is in terms of a percentage of the most generally used alloy, forging brass = 100 percent.

†Relative forgeability rating takes into consideration such variable factors as pressure, die wear and plasticity (hot).

\*Machinability related to "Free Cutting Brass Rod" (100 percent).

Table 2—Commercial Dimensional Tolerances,  
Hot Pressed Copper and Copper-base Alloy Forgings

Forging Types										
Thin Section, Long, (6 in. to 14 in. incl.)	Thin Section, Round	Draft Angles Outside and Inside, 1 to 5 deg.	Machining Allowance (One Surface)	Flatness (Max. Dev. per Inch)	Concentricity (Total Indicator Reading)	Nominal Web Thickness	Tolerance	Nominal Fillet & Radius	Tolerance	Approximate Flash Thickness
0.012	0.015	0.012	1/2	1/32	0.005	0.030	5/32	1/64	3/32	1/16
0.010	0.015	0.010	1/2	1/32	0.005	0.020	1/8	1/64	1/16	3/64
0.010	0.015	0.010	1/2	1/32	0.005	0.020	1/8	1/64	1/16	3/64
0.010	0.015	0.010	1/2	1/32	0.005	0.020	1/8	1/64	1/16	3/64
0.010	0.015	0.010	1/2	1/32	0.005	0.020	1/8	1/64	1/16	3/64
0.010	0.015	0.010	1/2	1/32	0.005	0.020	1/8	1/64	1/16	3/64
0.014	0.020	0.014	1/2	1/32	0.005	0.030	3/16	1/64	1/8	5/64
0.012	0.015	0.012	1/2	1/32	0.005	0.030	5/32	1/64	3/32	1/16
0.010	0.015	0.010	1/2	1/32	0.005	0.030	1/8	1/64	1/16	3/64

TABLE 1. Commercial dimensional tolerance for such alloys appear in TABLE 2.

Savings possible with nonferrous forgings are illustrated by a simple threaded fitting, *Fig. 3*. Formerly machined from 1 3/4-inch hexagon rod, a production run required 1580 pounds at a cost of \$0.1492 per pound or \$235.74. As a forging produced from round stock, only 932 pounds of material was required at \$0.1376 per pound or \$128.24. In addition to material savings of \$107.50, savings in labor cost brought total savings to approximately three cents per piece.

Brass and bronze forgings are manufactured in a variety of finishes such as: pickled, bright dipped, satin, bright polished, lead dipped, plated with nickel chromium, copper or other materials.

Of particular significance is a recent development for forging magnesium aircraft fittings. While structural magnesium forgings for aircraft have been produced for some time, magnesium fittings were considered impracticable especially on small mechanical presses. However, they were especially desirable because of high burst strength, lightweight compatibility with aluminum tubing and suitability for use with fiberglass tubing. The Commercial Brass Co., Fowlerville, Mich., found that with some revision in technique, such magnesium parts could be readily forged, *Figs. 4 and 5*.

Diameter and length of the forging slug must be carefully controlled. Dies used have a vapor-blast finish. A variety of lubricants have been successfully employed: peanut oil mixed with water, graphite or a mixture. No burned-on residue re-

sults from any of these lubricants. After forging, parts are dipped in hot water and in nitric acid, and then are cold-water rinsed.

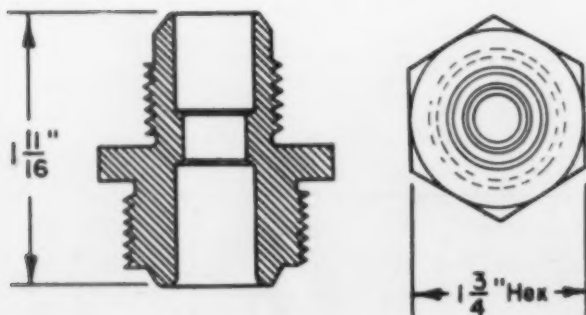
For best results, forging dies for magnesium must be varied somewhat in design from brass forging dies. Radii especially should be slightly more generous. In experimental runs, however, dies designed for brass parts have produced satisfactory results with magnesium. Cores have been forged in nuts, tees, nipples and other fittings, thereby reducing size required for original slug, cutting down machining needed and leaving less scrap.

Another interesting application of mechanical press forging is in the production of jet engine buckets. Indicating refinements possible in the process, the parts are precision forged so that further finish machining operations are required only at the anchor end of the blade. Other than that the part is merely given a minor surface treatment—sand blasting or light pickling and polishing to finish. One of the superalloys, S-816, with a high content of cobalt, chromium and nickel is used.

To secure the precision required, the stock is first preformed in reducer rolls. To reduce material waste of the expensive alloy and to assure positive handling, tong holds are attached to the prepared blanks in a semiautomatic welding operation. Rotary-hearth, controlled-atmosphere electric furnaces are used to heat the billets to forging temperature, preventing oxidation and scale formation. The actual forging process is done in two stages in 2500-ton presses, *Fig. 6*. The part is inspected after

Fig. 3. (below) Sketch of typical finished brass fitting produced as a forging.

Fig. 4. (lower right) Magnesium fitting being forged in small mechanical press at Commercial Brass Co., Fowlerville, Mich.



## drop forging

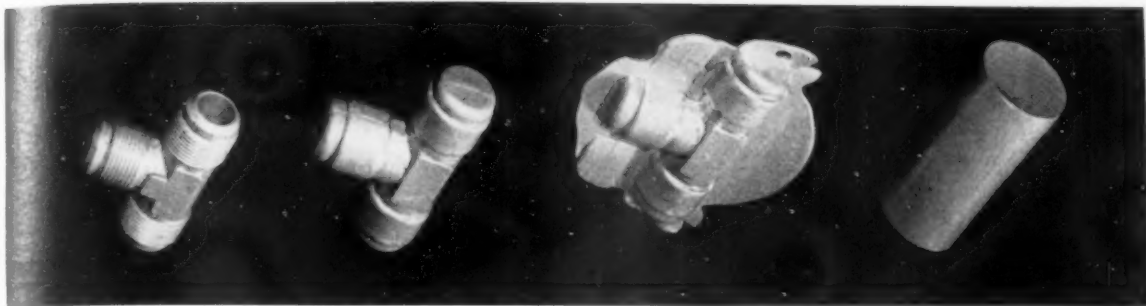


Fig. 5. Steps in manufacture of magnesium fitting showing correctly sized slug (left), as forged with flash, trimmed and machined.

blocking and is reheated for final forming and trimming.

### Hydraulic Press Forging

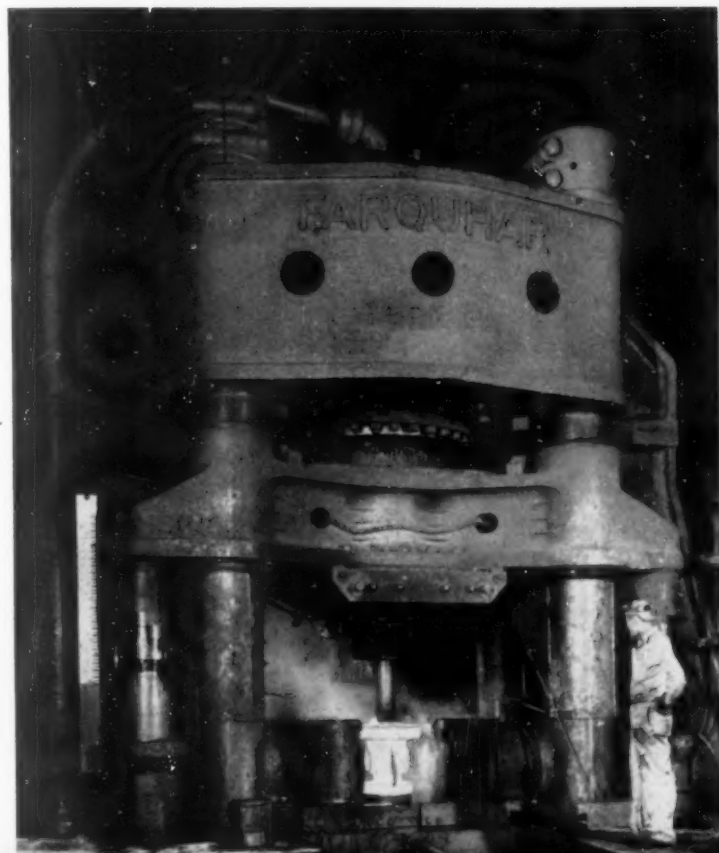
Hydraulic presses are commonly used where higher pressure, longer stroke or greater versatility is required. Many of the spectacular developments in the field have been achieved with this medium. For example, manufacturers and processors of large steel products have been forced to rely on castings since facilities to make large forgings of intricate design have been lacking. Because of difficulties with castings exposed to high pressures and extreme temperatures the Cameron Iron Works, Inc., Houston, Texas, developed a split die press forging technique that makes possible forging large sizes and intricate shapes.

This method has succeeded in producing a higher quality steel product at lower manufacturing cost. Most of the parts are for heavy service oil-well equipment two to four feet in height and a foot or more in diameter. The technique differs from conventional press forging practices in that it incorporates horizontal rams as well as conventional down-acting rams. For most forgings a side ram serves to hold the split die together while the vertical ram is used to displace metal into the cavities of the die and for piercing. For some forgings, however, the side rams may be used to pierce or displace metal while the die is held closed by the main ram, Fig. 7.

These large-size forgings secure the same advantages usually found in forgings, including controllable grain flow characteristics for high strength, Fig. 8, and a uniformly high quality free from

Fig. 7. Split die forging a double-flanged well-head fitting at Cameron Iron Works. Three operations are performed in one heat: slight upset, blocking operation, and finally piercing after blocking ram is retracted.

Fig. 6. First forging operation on jet bucket is blocking. Operator removes blank from electric heating furnace, grasping it with tong hold, which permits faster handling and more accurate positioning in the die as well as savings in material.





—Photo courtesy Cameron Iron Works

**Fig. 8.** Etched section of valve body illustrates correlation of design of part and die to provide optimum strength by proper control of grain flow.

internal defects. Bosses, flanges and cavities are forged to the specified size with excess stock allowed only where finish machining is required. Since the process requires little or no draft on either internal or external surfaces, both material and machine work are saved.

A new Split-die forging press recently installed is the largest of the kind constructed to date. It can exert a total force of 11,000 tons on the vertical ram. Two side rams can normally exert a load of 4000 tons each but the force can be intensified for special operations to 6000 tons. An unusual feature is an auxiliary 3000-ton down-acting ram for piercing and similar operations. This ram can be used

**Table 3—Standard Die Closure Tolerances**

Net Weight of Forging Magnesium (lb)	Net Weight of Forging Aluminum (lb)	Die Closure Tolerance (inch)
0-1/4	0-1/4	+0.032-0.010
1/4-1	1/4-1	+0.032-0.015
1-3	1-4	+0.045-0.032
3-11	4-17	+0.062-0.032
11-16	17-24	+0.078-0.032
16-33	24-50	+0.093-0.032
33-67	50-100	+0.125-0.045
67-170	100-250	+0.187-0.062
170 ...	250 ...	+0.250-0.062

to force a relatively small punch into the hot metal in the die to displace, under high unit pressure, metal to all corners of the die cavity after the primary forging operations have been accomplished by the main and side rams. Final limits of the process have yet to be explored though the potential range of application of the technique is great.

In general, the same principles apply in forging either in mechanical or hydraulic presses as with

drop hammers. There are definite advantages obtained by using presses for certain types of work, however. As noted previously, draft angles can be practically eliminated when the split die process is used. For conventional closed dies, draft angles considerably less than standard seven degrees used

**Table 4—Standard Length or Width Tolerances**

Linear Dimension (in.)	Exterior Dimensions (in.)	Tolerances Interior Dimensions (in.)	Step and Center Dimensions (in.)
Up to 8	+0.032 -0.016	+0.016 -0.032	±0.016
Over 8 add per inch	+0.004 -0.002	+0.002 -0.004	±0.002

**Table 5—Standard Mismatch Tolerances**

Net Weight of Forging Magnesium (lb)	Net Weight of Forging Aluminum (lb)	Mismatch Tolerance (in.)
0-1	0-1	0.015
1-5	1-7	0.018
5-9	7-13	0.021
9-13	13-19	0.024
13-17	19-25	0.027
17-21	25-31	0.030
21-25	31-37	0.033
25-29	37-43	0.036
29-33	43-49	0.039
33-37	49-55	0.042
For each additional 1 1/3 lb	For each additional 2 lb	0.001

Note: Long, narrow forgings require larger mismatch tolerances as determined by the forging vendor.

in hammer work are possible because knockouts can be incorporated in the dies. Thus, five degrees, three and even less have been used successfully, depending on the design of the part.

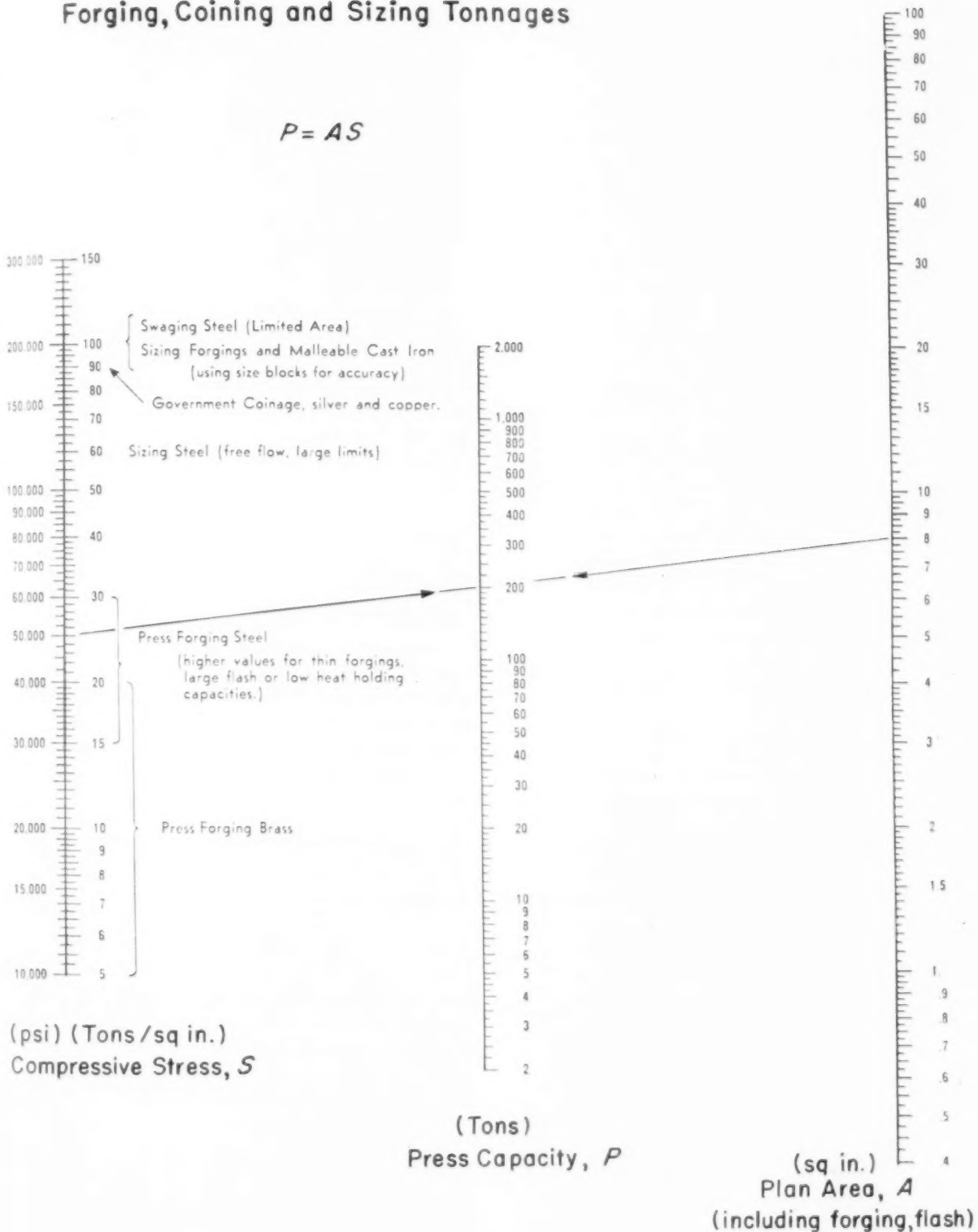
Common tolerances, shown in TABLES 3, 4, 5 and 6, while largely based on hammer work, apply equally to press forging. With proper control of stock volume, stock and die temperature, lubrication, surface condition of dies and die closure, however, part variations can be held to a minimum.

**Table 6—Standard Straightness Tolerances**

Part Length (in.)		Tolerance (in.)
From	To	
0	9	1/64
9	18	1/32
18	30	3/64
30	45	1/16
45	60	3/32
60	80	1/8

## Forging, Coining and Sizing Tonnages

$$P = AS$$



—Chart Courtesy E. W. Bliss Co.

Fig. 9. Nomograph for forging, coining and sizing tonnages. Chart gives an approximate basis for press selection.

## Selection of Presses

The amount of pressure required in any particular press forging operation varies with the material, shape and intricacy of the part. The pressure range is about 5 to 35 tons per square inch. Skill and experience are necessary to determine the tonnage requirement or press size for a given forging. Press selection should be made carefully to insure safe, economical operation. Charts are available from equipment manufacturers which can be used as a guide, *Fig. 9*. From this, press capacity can be approximated for a forging, coining or sizing operation. Proper allowance must be made for the character and arrangement of the job.

Press capacity may also be determined from direct tests by using the finished tools. In such cases, it is conservative practice to double the test pressure in selecting a mechanical press due both to its much greater speed and to the inflexible character of a good stiff machine, which contributes much to the accuracy of the finished product.

Working area is the projected area in the plan view of all surfaces of a job which are in contact with the die surfaces at the completion of the squeeze. In *Fig. 10a*, the forging is relieved at two points to reduce the squeeze area. In swaging or cold forging, *b*, pressures are higher due to more severe working. The illustration shows dif-

ferences in freedom of flow of material. Considerable judgment must be exercised in this connection in estimating the surface pressure which may be built up in completing the operation. Sketches *c*, *e* and *g*, the latter coining, illustrate other closed dies in which dangerous pressures are possible if care is not exercised. At *f* the die is relieved for the same purpose; and at *d* the area of the piece is increased by the area of the portion of the flash which is being squeezed.

In the sizing operation at *a*, the metal is entirely free to flow but the die comes together on solid contact surfaces, in order to make the accuracy obtained less dependent upon thickness and hardness of the original forging. Such surfaces should usually take at least as much pressure as the forging itself. Presses for this work are often selected on the basis of 100 tons per square inch, though the actual pressure on the surface of the forging may not exceed 25 or 30 tons per square inch.

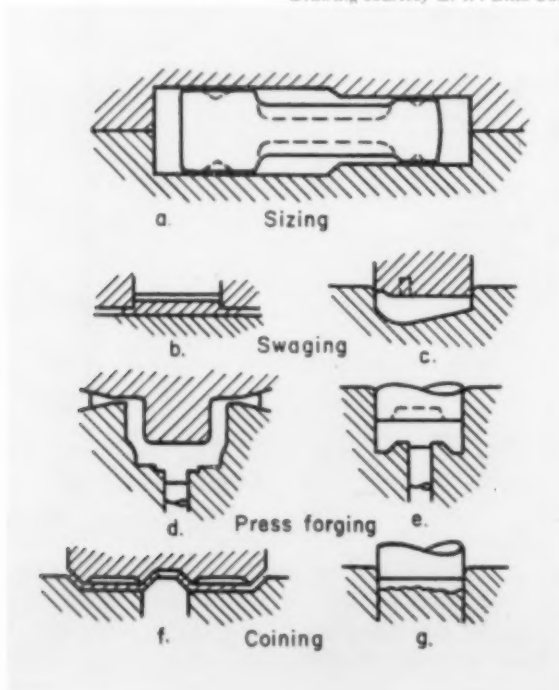
Hot forging pressures are figured conservatively at about a third of those for cold operations though proper forging heats often bring the actual pressures somewhat lower.

## Automation of Press Forging

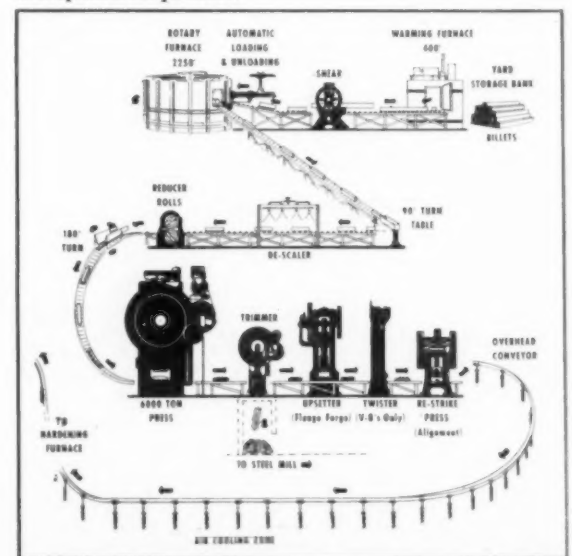
Eventually it may be possible to completely automate press forging lines to reduce unit costs. At present loading and unloading large parts in the press and especially positioning them in the die or relocating them in multiple impressions present

**Fig. 10. Typical operations illustrating restriction of metal flow: (a) sizing, (b) and (c) swaging, (d) and (e) press forging, (f) and (g) coining.**

—Drawing courtesy E. W. Bliss Co.



**Fig. 11. Mechanized line of the crankshaft press shop at Chrysler Corp. is depicted schematically. Handling is automatic except for positioning and removal of workpieces at presses.**



## drop forging



Fig. 12. Seating a partially formed crankshaft for finisher blow in a 6000-ton mechanical press at Chrysler Corp. Automatic water spray cleans forging and dies. The press can be operated at more than 35 strokes per minute for high-speed production.

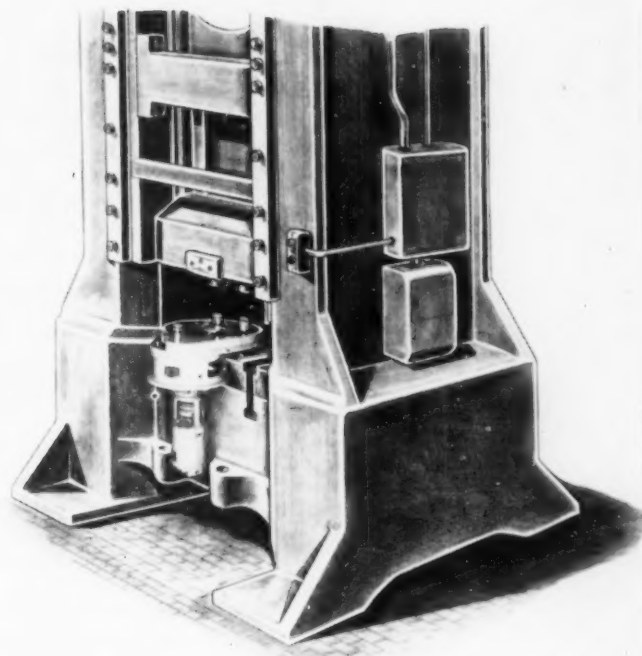
problems that are yet to be satisfactorily solved.

Mechanization of a press forging operation has been carried about as far as anywhere to date at Chrysler Corp. where two lines are in operation and a third is under construction for continuous forging of automotive crankshafts, Fig. 11.

Conceived and designed by Hautau Engineering Co., the system employs an elaborate arrangement of electrical, mechanical and hydraulic devices, either time controlled or actuated by trips or photoelectric tubes. Sheared billets are automatically loaded and unloaded in rotary heating furnaces. A jaw-type mechanism picks the billets from an elevator and lifts them into the furnace, saving wear and damage to the furnace floor. Unloading is performed by a similar machine.

Of particular interest is the reducer roll which preforms the heated billets, distributing material as needed for forging. The dies are equipped with automatic ejectors. A pneumatic loader is provided on the press, though final seating of the workpieces and positioning between the first and second strikes must be performed by the operator, Fig. 12.

Another recent development is an automatic press loader, Fig. 13, to be used with suitable small and medium-sized parts. It consists primarily of an index table and mechanism offset to permit mounting the die punch at dead center position of the ram, permitting maximum punch and die stability and loading of die blocks without interference. For completely automatic operation an auxiliary feeding device can be provided to eliminate manual feeding and removal of parts from the loader.



—Photo courtesy Hautau Engineering Co.

Fig. 13. Automatic press loader is a promising new development in mechanization of the forging processes.

### Large Nonferrous Aircraft Forgings

With the increasing demands of high-speed aircraft, the replacement of structural subassemblies by large forgings has been heralded as the answer to design and manufacturing problems. Compactness and high strength-weight ratio of forgings are attractive to designers. Production men sight great potential savings from elimination or reduction in machining and assembly operations. Extensive use of large forgings has been cited frequently as the only practical means of producing jet aircraft in quantities adequate for national defense.

Potentialities of the forging process with presses up to 50,000-ton capacity can only be extrapolated from present experience. Operation of several large presses above 15,000-ton capacity, such as shown in Fig. 1, offer some indications. Inherent limitations of die press forging are likely to be intensified in the larger sizes, requiring greater effort and ingenuity to overcome. Mismatch, length, width and thickness tolerances, press and die deflections will all be particularly difficult to hold within satisfactory limits.

Production engineers are generally skeptical of the widely held opinion that larger press sizes and higher pressures are the answer to all requirements for larger forgings regardless of how complex the design. It remains to be proven if forgings can

replace present light built-up structures of ribs and stiffeners, or thin integrally stiffened wing panels. No doubt answers will be found, but it appears they may be discovered in redesign of complex parts to simplify them and to make them more amenable to the forging process. Webs as thin as 0.18 inch have been produced on the Schloemann press at the Aluminum Co. of America but to secure the large web sections of 0.060 to 0.120 inch desired by

**Table 7—Comparison of Parts Forged from Cast Blanks and from Bar Stock**

Condition of Material	Tensile Strength (psi)	Yield Strength (psi)	Elongation (percent)
As cast	26,000	12,000	6
Cast and forged*	35,000	16,000	10
Forged from bar	44,800	30,000	16

\*10 percent reduction

designers may require new manufacturing techniques combining forging and machining.

Other problems still remaining to be solved include such items as lubrication of dies, vital because of the large area of metal being moved and difficulty of providing lubrication during the actual movement. Associated with this problem is

that of providing a smooth die surface by polishing, or perhaps even by plating, as has been suggested. These problems stem from the necessity of reducing unit pressures or resistance to metal flow, because of large volumes or areas of metal to be moved.

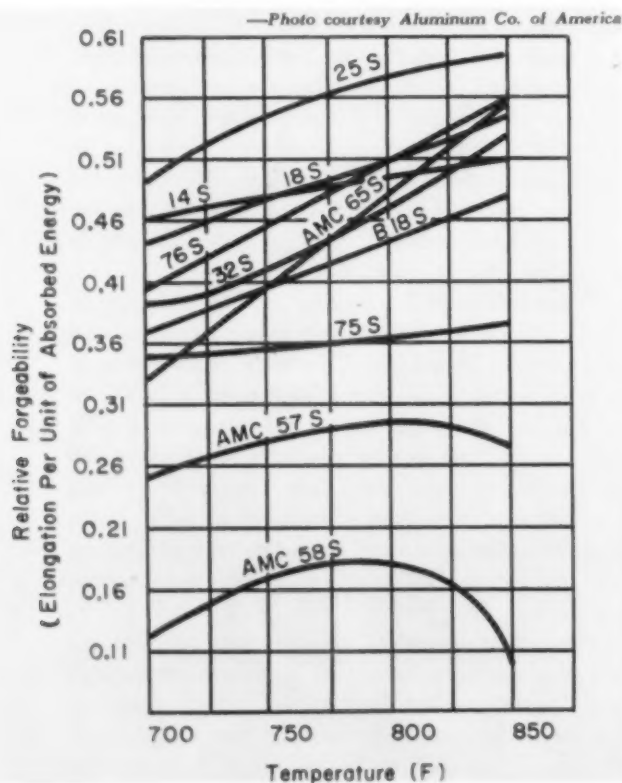
Closely controlled die temperatures as near to stock temperature as possible are a necessity on thin sectioned parts, to minimize thickness variations. Thus, to produce forgings of sizes proposed to satisfactory dimensional tolerances will doubtless involve development of new or improved manufacturing techniques.

Cost of dies will be a big factor. While tooling expenses in five figures can be justified economically in as few as 15 or 20 sets of parts in certain instances, as indicated by various studies, production engineers will be constantly searching for means of reducing these costs. So the number of stages required in press forging grows rapidly in importance as the size of the workpiece increases and becomes a vital matter with large forgings. Since forgeability of alloys, *Fig. 14*, figures largely in the number of operations required to block out a part, emphasis will be placed on use of alloys that are easier to forge.

It has been suggested that sectional dies and bolsters afford a means of overcoming lack of facilities for producing large dies. Cast steel and other materials are also being studied for dies as a possibility for lowering costs and providing greater versatility for the presses.

Several sources are available for the size of stock required. Ingot production and methods of pre-forming are under study. One interesting possibility is the use of blanks cast to rough shape to be finish forged to final form. It appears now that such forgings would not be as strong or ductile as if forged from bar stock, *TABLE 7*. This table shows cast and forged parts with ten percent reduction slightly more than half the yield strength and of considerable lower tensile strength than those forged from bar stock.

**Fig. 14. Relative forgeability of aluminum alloys.**



## Acknowledgments

The helpful cooperation of the following organizations in supplying information is gratefully acknowledged:

The Aluminum Association.....New York  
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 Forging Manufacturers Assn.....New York  
 Hautau Engineering Co.....Ferndale, Mich.  
 Loewy Construction Co., Inc.....New York  
 Mueller Brass Co.....Port Huron, Mich.  
 Nelson Stud Welding Div.....Lorain, Ohio

# Square and Hexagon

## Bolt Standards

(Revised)

Square and Hex Bolt Stds.

**A**N IMPORTANT REVISION of the American Standard on hexagon and square bolts and nuts has been completed after five years' intensive study, and collaboration with British and Canadian standards groups. The new standard is identified as ASA B18.2-1952. Copies are available from the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. The following information is presented by courtesy of Industrial Fasteners Institute, Cleveland, Ohio.

Major advantages of the revision include:

1. Complete specification of characteristics that previously varied with individual or trade practice. In addition to general head proportions body diameters and tolerances, thread pitch and class, thread length, pointing, recommended materials and other details required in the specification, manufacture, selection and application are shown.
2. Elimination of unnecessary differences between hexagon cap screws, automotive bolts and regular bolts, as well as between light and regular nuts.
3. Simplification of wrench equipment.
4. Conservation of material.
5. Vitally needed unification and coordination with British and Canadian standards for defense purposes.

### Consolidation of Light and Regular Series

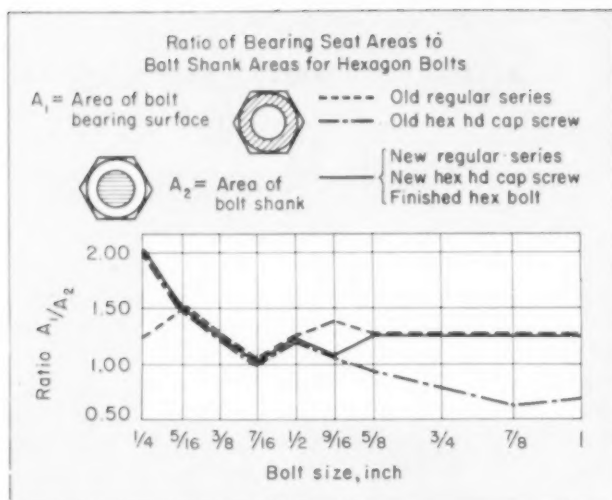
The former light and regular series tended to overlap in dimensions, characteristics and applications in smaller sizes. Old and new across-flats dimensions are compared in TABLE 1. Reference to this data shows the simplification achieved in this series by using as bases: (a) former across-flats dimensions of automotive hex head bolts or cap screws for sizes up to and including 9/16 inch; (b) former across-flats dimensions of the regular hex bolts for bolts 5/8 inch and larger; (c) former across-flats dimensions of the light series for sizes up to and including 5/8 inch; (d) former across flats dimensions of the regular series nuts for sizes above 5/8 inch.

### Head Height and Thickness of Nuts

The head height of the new standard uses a ratio of 5/8 of the nominal diameter. Thus height of head of cap screws and automotive bolts has been reduced slightly with some savings in weight and material. The nominal thicknesses of nuts now conform with those of

Table 1—Across—Flats Dimensions

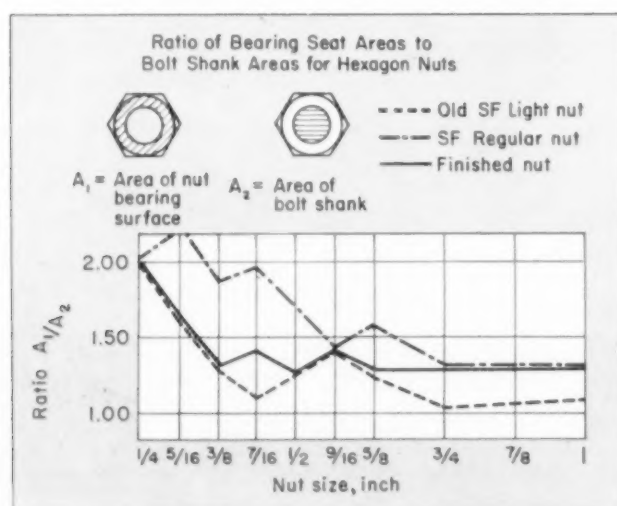
(All Dimensions in Inches)						
Old Standards				New Standards		
Size	Cap Screws Auto Bolts	Regular Bolt	Light Nut	Regular Nut	Bolt Cap Screw	Nut
1/4	7/16	3/8	7/16	7/16	7/16	7/16
5/16	1/2	1/2	1/2	9/16	1/2	1/2
3/8	9/16	9/16	9/16	5/8	9/16	9/16
7/16	5/8	5/8	5/8	3/4	5/8	11/16
1/2	3/4	3/4	3/4	13/16	3/4	3/4
9/16	13/16	7/8	7/8	7/8	13/16	7/8
5/8	7/8	15/16	15/16	1	15/16	15/16
3/4	1	1 1/8	1 1/16	1 1/8	1 1/8	1 1/8
7/8	1 1/8	1 5/16	1 1/4	1 5/16	1 5/16	1 5/16
1	1 5/16	1 1/2	1 7/16	1 1/2	1 1/2	1 1/2
1 1/8	1 1/2	1 11/16	1 5/8	1 11/16	1 11/16	1 11/16
1 1/4	1 11/16	1 7/8	1 13/16	1 7/8	1 7/8	1 7/8
1 3/8		2 1/16	2	2 1/16	2 1/16	2 1/16
1 1/2		2 1/4	2 3/16	2 1/4	2 1/4	2 1/4
Larger sizes of bolts and nuts not shown					Larger sizes same as regular series.	



**Table 2—Height of Heads and Thickness of Nuts**

(All Dimensions in Inches)

Size	Old Standards			New Standards		
	Cap Screws Auto Bolts	SF Regular Bolt	Light Nut	Regular Nut SF	Bolt Semi-fin, Finished, Cap Screw	Nut Fin- ished
1/4	3/16	5/32	7/32	13/64	5/32	7/32
5/16	15/64	3/16	17/64	1/4	13/64	17/64
3/8	9/32	15/64	21/64	5/16	15/64	21/64
7/16	21/64	9/32	3/8	23/64	9/32	3/8
1/2	3/8	19/64	7/16	27/64	5/16	7/16
9/16	27/64	11/32	31/64	31/64	23/64	31/64
5/8	15/32	25/64	35/64	17/32	25/64	35/64
3/4	9/16	15/32	21/32	41/64	15/32	41/64
7/8	21/32	9/16	49/64	3/4	35/64	3/4
1	3/4	19/32	1/8	55/64	39/64	55/64
Larger sizes not show				Larger sizes same as regular bolts and nuts		



previous light series for sizes  $\frac{1}{4}$  through  $\frac{3}{8}$  inch and with those of the regular series for sizes above  $\frac{5}{8}$  inch. A comparison of these dimensions is shown in TABLE 2.

### Square Bolts, Nuts, Set Screws and Lag Screws

The proportions of square bolts and nuts, machine screw nuts, and set screws are unchanged from the former standard. Specifications have been expanded and some have been added for lag bolts.

### Heavy Series Bolts and Nuts

These have been continued with essentially the same proportions as before. A new Heavy Finished Hexagon Bolt has been added to satisfy demand for a bolt in the heavy series with close body tolerances in all sizes.

### Nomenclature Changes

Unfaced bolts in the regular series are known simply as Regular Square Bolts and Regular Hexagon Bolts. The unfaced bolt in the heavy series is called the Heavy Hexagon Bolt. Bolts that are faced or otherwise processed to have a washer bearing surface are classed as follows:

- (1) Those having body tolerances that may vary above and below the nominal bolt diameter.
- (2) Those having closer body tolerances that vary only on the minus side of the nominal.

The term Semifinished was continued for the first class in the names Regular Semifinished Hexagon Bolts and Heavy Semifinished Hexagon Bolts. For the second class the term Finished is used for the multiple purpose of indicating washer face, close body tolerances and consolidation of products known as automotive hexagon head bolts and regular semifinished close-tolerance bolts.

Since products having characteristics comparable with those of Finished bolts have long been known as Cap Screws, this name has been retained for the listing of the same proportions and tolerances in the size range of  $\frac{1}{4}$  to  $1\frac{1}{2}$  inches. In the heavy series no consolidation of products was involved, and the term Finished in Finished Heavy Hexagon Bolts denotes the close body tolerances.

The name Finished Hexagon Nuts designates the new consolidation of washer-faced or double chamfered light and regular nuts. The term Semifinished is continued in the names of washer-faced or double chamfered nuts in the heavy series and in the temporary listing of the old regular semifinished nuts until they are replaced by the Finished Nuts.



# news



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One of the country's most famous landmarks, Independence Hall, originally known as the State House, was the seat of the Continental Congress at the time the Declaration of Independence was adopted in 1776.



## 'Tooling for Competition' to Keynote Exposition Week in Philadelphia

by Nancy L. Morgan

At a time when all industry is entering a highly competitive business era, ASTE's 1954 Industrial Exposition and Annual Meeting will have added impact and significance for the thousands of engineers who will gather at the Philadelphia Convention Center between April 26 and 30. "Tooling for Competition," the theme for the convention week, will keynote the entire program of activities.

Recognized as the major industrial exposition of inspection and automatic devices, cutting tools, machine tools, accessories, and allied equipment, the ASTE Exposition this year includes over 460 exhibitors. More than 155,000 square feet of exhibit space will be utilized in showing the latest development in production equipment and manufacturing processes.

Running concurrently with the Exposition will be 49 industrial conferences covering the most

timely subjects of the day. Outstanding authorities in the fields of plant management, cutting and grinding, forming and assembly, automation, and precision control will be featured in an integrated program of papers and panel discussions

### Five-Day Technical Program

Technical sessions presented during the five-day program have been specially designed to offer the knowledge and experience of experts on using the most effective equipment and processes. In total, the papers and panels will reflect what tool engineers are thinking about most in 1954.

In the area of machinability, the conferences will show how research can double productivity, how to cam control the grinding of concave and convex forms, and how ultrasonic machine tools can cut all the modern synthetic materials.

newly discovered facts about cutting and forming titanium will be revealed, and the latest advances in pantographic and jig milling will be discussed. Vital milling problems will be covered at the panel on improved milling practice.

Another conference will present a forecast of possible effects of atomic-fission products on design of tools, instruments, and processes. Other discussions will cover holding nonferrous and ferrous parts with magnetic chucks, cold steel extrusion and proper design, plastics in the field of tool engineering for fixtures and dies, and tools and tooling for automatics.

Three panels of experts will help solve the problems of production planning and control, inspection and quality control, and workholding ways and means. Speakers will tell how roll-extruding or a rubber-clamping assembly may be the answer for thin-walled parts, how to flame cut with electric eye control, and how post-forming plastics can solve difficult production problems.

What's new and best in surface cleaning, proof that abrasive-belt grinding can accurately hold angles on carbide tools, and little-known facts about high production tooling for induction heating will be discussed. Other topics will include welding and brazing high-temperature materials such as stainless steel 347, cobalt alloy 25, and titanium, and preparing metal surfaces for chromizing and electroless nickel plating.

### Carbide Institute Scheduled

An added attraction for those who bring carbide tool problems to the Exposition will be the University of Pennsylvania Carbide Institute, organized and directed by university officials and the American Society of Tool Engineers.

The Institute will offer the latest and most authoritative information available on carbides. An industry-wide venture, the individual sessions will feature experts from Carboloy Department of General Electric Co., Firth-Sterling, Inc., Kennametal, Inc., and other leading companies.

Meetings will be held at the Towne School of Engineering at the University of Pennsylvania, practically next door to the Convention Center, every day from 9 to 12 noon. Some programs may be extended for additional discussion periods.

Lee N. Gulick, dean of the Towne School, and A. R. Diamond, head of the ASTE National Education Committee, are in charge of the program. Edmund Hollingsworth is chairman of the ASTE carbide institute subcommittee.

Shop demonstrations at the Institute will be televised on a closed circuit for viewing on a 30-inch screen at the lecture halls. This unusual plan has been developed by Prof. O. D. Lasco of Purdue University's General Engineering Department. A

member of the National Education Committee, he will direct the TV activities.

On Monday, April 26, the economics of carbides, how carbides can affect production and profit, and what carbides have done for other firms will be discussed in "An Address to Management."

Tuesday's program, entitled "Tool Fabrication and Tool Maintenance in the Shop," will emphasize grade selection, design and manufacture; and brazing, grinding, salvage, handling and control.

Wednesday audiences will learn how "It Pays to Be a Good Tool Detective." Subtopics will include: intelligent use of carbide; extending tool life; and the influences of proper application of grades, design, speeds, feeds, setup and operation

*(Continued on next page)*



(Above) An aerial view of the Benjamin Franklin Parkway and downtown Philadelphia shows the famed Philadelphia Museum of Art in the foreground.

(Below) The Convention Center will serve as headquarters for the ASTE Industrial Exposition and day-time technical conferences of the Annual Meeting.



University of Pennsylvania's Towne School of Engineering, near the Convention Center, will be the site of the Carbide Institute where daily sessions will offer the latest information on carbides.



### Chancellor of New York University Will Address ASTE Banquet Audience

Dr. Henry T. Heald, well-known educator, administrator, business executive, engineer, and civic leader, will appear on the program of the 1954 Industrial Exposition and Annual Meeting as keynote speaker. He will address the audience at ASTE's 22nd Annual Banquet to be held April 28 at the Bellevue-Stratford Hotel. His subject will be "Pattern for Progress."

Dr. Heald is chancellor of New York University, America's largest. He has served as president of Armour Institute of Technology and Illinois Institute of Technology in Chicago. He was also president of Illinois Tech's affiliated institutions, Armour Research Foun-

(Continued from preceding page)

in analyzing tool wear and obtaining maximum performance at low cost. This session will answer the 'how?' and 'why?' for maximum carbide efficiency.

The program for Thursday will highlight "Advanced Application Techniques," including turning, milling, slotting, drilling, reaming and trepanning. Present and future trends in machine and tool development will also be noted.

Friday sessions will open with lectures on "New Developments and the Industry Forecast for the Use of Carbides," followed by panel discussions on: carbide dies, machining nonmetallics, carbide gages and wear parts, precision boring and super-finishing, and broaching, planing and hobbing with carbides.

Attendance at the Carbide Institute is limited to 400 and will be by advance registration only. A \$10 fee for any or all sessions has been set. Students from Drexel Institute of Technology, Villanova, and the University of Pennsylvania will be admitted free of charge.

All registration will be handled on a "first come, first served" basis by the University of Pennsylvania. Checks or money orders should be sent as soon as possible to: Dean Lee N. Gulick, Towne School of Engineering, University of Pennsylvania, 34th and Woodland Ave., Philadelphia, Pa.

dation and Institute of the Gas Technology.

Recipient of numerous national awards in engineering and education, Dr. Heald has been president of the Society for Engineering Education and the Western Society of Engineers, and vice chairman of the Educational Council for Professional Development.

He is active in business, serving as director of American Steel Foundries, Equitable Life Corporation of New York, Stewart-Warner Corp., Assurance Society of the U. S., Research Cor-

Dr. Heald's government activities include service for the Housing and Home Finance Agency, the Office of the Secretary of Defense, and the Department of the Army.

Howard C. McMillen, far right, third vice president of ASTE, has just presented the charter to Chairman Leslie L. Thill. Also pictured from left, Wayne T. Bates, treasurer; Robert J. Helton, secretary; David MacGregor, second vice chairman; and Cecil E. Chapman, first vice chairman of the chapter.



## Society Charters Calumet Area Chapter

By Edith R. Saunders

Membership in the American Society of Tool Engineers reached a new high of 28,255 with the chartering in January of the 112th chapter at Whiting, Indiana. Known as the Calumet Area chapter, the group has 100 charter members, chiefly from East Chicago, Gary, Hammond and Whiting.

National ASTE officers and representatives from five nearby chapters were guests at the charter meeting held at Vogel's Restaurant on January 13. Roger F. Waindle, national president of ASTE, and Harry E. Conroad, executive secretary of the Society, were on hand to officially welcome Calumet Area members to the Society and install the officers.

Howard C. McMillen, third vice president of ASTE, presented the charter to Leslie L. Thill, chairman of the chapter and chief inspector with Continental Foundry & Machine Co., East Chicago.

Other officers who will lead the group in its first year of activity are: first vice chairman—Cecil E. Chapman, superintendent, Roll Accessories, Inland Steel Co., East Chicago; second vice chairman—David MacGregor, works manager and chief engineer, Edward Valves, Inc., East Chicago; secretary—Robert J. Helton, tool engineer, American Steel Foundries, Hammond; and treasurer—Wayne T. Bates, methods engineer, Combustion Engineering, Superheater, Inc., East Chicago.

Dr. Frank C. Hockema, vice president and executive dean of Purdue University, was the guest speaker on the evening program. In his stimulating address, Dr. Hockema presented a number of challenges to the newly chartered chapter. He urged all members to actively participate in ASTE pro-

grams and the organizational work so that the group can take its proper place as a strong force benefiting the entire community.

The importance of tool engineering to the present-day economy was stressed, with additional emphasis placed on raising the current standard of living to an even higher level. Dr. Hockema placed much responsibility for the future of the nation and the world on the shoulders of the tool engineer.

At the close of the meeting, Chairman Thill offered sincere thanks to Tom Barber and Verne Loeppert of the Chicago chapter for their wholehearted cooperation in getting the chapter on its feet. He also thanked the representatives from South Bend, Indianapolis, Chicago, Evansville and Rockford chapters for their support.



Roger F. Waindle, national president of ASTE, congratulates Chairman Leslie L. Thill after the ceremonies which have made Calumet Area chapter an official member of the Society.

Each day of the Exposition, these top-level Conferences\* on New Industrial Developments will be held right in the Convention Center . . .

**APRIL 26  
MONDAY**

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Conferences*

**APRIL 27  
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*Automation  
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**APRIL 28  
WEDNESDAY**

*Cutting &  
Grinding  
Conferences*

**APRIL 29  
THURSDAY**

*Precision Control  
Conferences*

**APRIL 30  
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# ASTE Board of Directors Approves New Status of Chapter Delegates

Replacing the former chapter delegate, a plan creating a new position of "national delegate" was approved on January 27 by a special vote by the Society's Board of Directors. Because this change is effective immediately and has a direct influence on the annual chapter elections held in February, a detailed report outlining the responsibilities of the new chapter office was sent the same day to all chapter chairmen from ASTE President Roger F. Waindle.

One of the most important functions of the national delegates is to represent the chapters at the annual House of Delegates' Meetings where the ASTE Board of Directors is elected.

In support of this vital responsibility, the chapters will be reimbursed with a sum equivalent to round-trip, first-class rail transportation within two weeks after recorded attendance of the delegates at these meetings. The reimbursement will include a lower berth or parlor car seat wherever distances traveled warrant.

## Expenses to be Shared

This means that all chapters sending national delegates to this year's meeting of the House of Delegates scheduled for April 28 in Philadelphia will be responsible only for meals and hotel accommodations for the delegates and their bills for incidentals.

The sharing the financial obligations of sending delegates to these meetings should help assure a one hundred-percent representation of ASTE chapters by their own chapter national delegates.

The delegates will also participate in the formulation of an agenda on problems of policy of board chapter implications for meetings of the House of Delegates.

Another important responsibility of the new office is maintaining a continu-

ing link of communication between the chapters and national headquarters. This will be implemented by distribution of all informative data from headquarters which is supplied to all national officers and directors so that the national delegates will become fully informed on matters of ASTE policy and may keep their chapters up to date on national Society activities.

The National Progress Committee, which devoted considerable time to the 'National Delegate Plan' which was originally presented by the national officers at the 1953 meeting of the Board of Directors, advised in its recommendations that the incoming chapter chairman be chosen alternate national delegate and that the outgoing to retiring chapter chairman be elected to the national delegate's post.

The reasons for this suggested procedure is that the outgoing chairman, having completed his duties as chairman and having previously served as alternate, will be in an improved position to carry out the responsibilities of national delegate. By the same token, the incoming chapter chairman through his exposure to national Society matters as alternate, will gain experience that will assist him in the execution of his duties as chapter chairman.

It was emphasized by the Progress Committee that the chapter chairman will suffer no loss of prestige through the improvement of the delegate's status, since each officer has his own separate responsibilities.

In this regard, President Waindle said, "Under no circumstances is the national delegate to pre-empt the prerogatives of the chapter chairman, but is to assist his chairman in relations with national."

The chapter chairman is busy as the "top" administrator of his chapter, in proper liaison with the national organization. On the other hand, the national

delegate through his chapter experience, can best present his chapter's problems to the national organization. And through the running knowledge the delegate will accumulate through the communications system of receiving all materials sent to national officers and directors, he will be extremely well-qualified to present national ASTE affairs to his chapter.

## Another Step Forward

In drawing up the 'National Delegate Plan' the national officers of ASTE feel unanimously that it is another significant step forward in cementing relations between the national and chapter levels and will increase the dignity and prestige of the chapter, as well as the reservoir of possible candidates for national committees, thereby accentuating the fundamental democratic principles of ASTE.

When members of the National Progress Committee met to appraise the National Delegate plan, they were enthusiastic about the proposals of the national officers and thought the plan would be instrumental in furthering the Society's goal of providing the greatest possible service to ASTE members everywhere.

The Progress Committee's report which was made by Chairman Ray H. Norris, an ASTE past president, indicates that much effort has gone into the formulation of the National Delegate Plan and echoes the unanimous approval of the committee members: President Waindle, chairman of the Board of Directors; L. B. Bellamy, past president and a national director; H. C. McMillen, third vice president and a national director; R. C. W. Peterson, national secretary; Wayne Ewing, assistant secretary-treasurer; Harry E. Conrad, executive secretary of ASTE; and L. G. Singer, Toronto chapter.

## Contest Winners Announced

Response to the ASTE news coverage contest for THE TOOL ENGINEER sponsored by the National Editorial Committee was overwhelming! A total of 207 news reports were received during the three months of competition, and 54 editorial chairmen furnished reports for all three issues of the magazine. Still more records were broken in November when a new all-time high for chapters represented in a single issue was reached with 73 chapters reporting their activities.

Because of the tremendous flow of reports that poured into the magazine's news department, judging the winners was very difficult for the members of the National Editorial Committee—Chairman Joseph L. Petz, Lee M. Davis, Edward W. Dickett, David A. Schrom, Gordon Swardenski, Charles Thuman, and George P. Torrence. After hours of deliberation, Mrs. Sara T. Moxley, editorial chairman of the Long Island chapter, was selected the winner of the division for the best and most complete coverage over the three-month period, and Donald Cox, editorial chairman of the Lima, Ohio chapter, was winner in the best individual report division.

Members of the Editorial Committee decided that the outstanding reporting jobs of ten other editorial chairmen demanded recognition by the judges, and also agreed that they had earned honorable mention awards.

Specially designed and inscribed plaques are going to:

Herbert Anderson  
Albuquerque

Laurence R. Green  
Chautauqua-Warren

Louis H. Schumann  
Cincinnati

Marshall M. Rosenbarger  
Indianapolis

Harold J. DePew  
Mid-Hudson

Russ Saur  
Peoria

John J. Schroth  
Philadelphia

Kenneth Hull  
Rockford

Elmer Graser, Jr.  
St. Louis

A. McKinney Rice  
Toronto

Joseph L. Petz, chairman of the Editorial Committee, notified all winners immediately, sending congratulatory telegrams to Mrs. Moxley and Mr. Cox and letters to the recipients of honorable mention awards. The other 42 chairmen who had proven their interest in the contest by submitting a report for all three issues, were also thanked for their support by letter.

The top winners, Mrs. Moxley and Mr. Cox, will be receiving copies of the Tool Engineers Handbook with their names inscribed in gold, appropriately designed plaques, and free trips to Philadelphia to be awarded the plaques at the Membership Banquet of the Annual Meeting on April 29.

The free trips to Philadelphia are an extra dividend, decided upon unanimously by the Editorial Committee which was greatly impressed by the efforts put forth by the winners and the committee is footing the trip expenses.

### Cutting Oils Topic at New Haven Meeting

New Haven, Conn.—On January 14 New Haven chapter members and guests met at Hotel Garde. Some 35 were present despite a heavy snow storm which bogged-down transportation facilities.

In a short business session preceding the technical program, five new members were introduced and it was announced that the annual Connecticut Day would be held in Hartford at Hotel Bond.

Frank Shute, technical chairman, then introduced the speaker for the evening who was H. A. Erickson, director of engineering, D. A. Stuart Oil Co. His subject was "Cutting Oils, Coolants and Waxes."

—Silas W. Becroft

### Detroit Schedules Psychologist as Speaker

Detroit—Members and guests of the Detroit chapter will gather at the Rackham Memorial Building on March 11 to hear an eminent psychologist. Dr. Murray Banks, former professor of psychology and for five years head of the psychology department at Long Island University, is the scheduled speaker.

—Walter Schober



Leslie Seager, candidate for national director; George Sanborn, sales manager, Fellows Gear Shaper Co., and Frederick Preator, professor of engineering, Utah State Agricultural College, Logan, Utah, are pictured at the January 15 meeting of Salt Lake City chapter.

### Gear Production Topic at Salt Lake

Salt Lake City—Some 57 members and guests attended the January 15 meeting of Salt Lake City chapter at the Tower House Coffee Shop. The technical program featured a talk on "The Design and Production of Gears," by George Sanborn, sales manager of the Fellows Gear Shaper Co., Springfield, Vt.

The speaker first described the basic design of gears, pointing out that the involute form has become the basis of the majority of gears produced today, because it can be produced more accurately and economically in present-day mass-production methods. Mr. Sanborn discussed the variety of methods of cutting gears in today's production and some of the new developments for obtaining high accuracy and good finish.

—Reid L. Rice

### Harrington Presents Portland ASTE Program

Portland, Me.—The Graymore Hotel was the scene of Portland's first meeting for 1954 on January 8. Main event on the business docket was a report of the nominating committee, John M. Johnston, Ned Andrews and Henry C. Hagman. The committee proposed a slate of Harold Chaplin for chairman, James Comeau for first vice chairman, Ross Beaubien for second vice chairman, Howard Stevens for secretary, and Frank Thomas for treasurer.

John A. Harrington, chief engineer of the DoAll Co., Boston, Mass., was the technical speaker on the program. Mr. Harrington discussed the necessity for proper wheel dressing and the results that can be obtained by using the right methods. Movies were also shown on precision grinding.

—Henry C. Hagman

## C. H. Thuman Named to ASTE Editorial Committee

Joseph L. Petz, chairman of the National Editorial Committee, has announced the appointment of a new committee member. He is C. H. Thuman, a past chairman of the Evansville, Ind. chapter of ASTE.



C. H. Thuman

Chief draftsman at Seeger Refrigerator Co., Mr. Thuman is responsible for the design, preparation and distribution of all engineering information pertaining to the release of the company's refrigeration products and also for Seeger's North American aviation contract. His previous experience includes positions at Servel, Inc. as a methods engineer; Atmospheric Nitrogen Corp. as assistant plant engineer; and Chrysler Corp. in Evansville as plant chemist and assistant plant engineer.

A mechanical engineering graduate of Purdue University and a registered professional engineer, he is a member of the American Society of Refrigerating Engineers, Indiana Society of Professional Engineers and the National Society of Professional Engineers.

Mr. Thuman has served as chairman of several chapter committees and also in a number of elective positions. He is currently head of the professional engineering committee and a member of the advisory committee.



Shown at Evansville's annual Executives Night on December 14 are: from left, Paul W. Vierling, chapter chairman; Howard C. McMillen, third vice president of ASTE and also a national director; Dr. Frank C. Hockema, vice president and executive dean of Purdue University and the guest speaker; and Henry Pernicka, past chairman of the chapter.

## Western Tour Made by Executive Secretary

Harry E. Conrad, ASTE executive secretary, recently completed a three-week tour of 12 chapters in the western part of the United States. He made the tour to meet with the executive committees, review their past activities and discuss future plans and projects of the Society.

On his itinerary were Albuquerque, Denver, Phoenix, Salt Lake City, and Tucson. After these meetings, Mr. Conrad went on to Los Angeles for a session with representatives of the California chapters, including Golden Gate, Long Beach, Los Angeles, San Diego, San Fernando Valley, San Gabriel, and Santa Clara Valley.

## California Examinations Available in Booklet

Through special arrangements made with the Board of Registration for the State of California, a booklet containing all past examinations offered for becoming a registered professional engineer in the field of mechanical engineering is now available to ASTE members.

The booklet was prepared by V. H. Gallichotte, member of the Society's National Professional Engineering Committee, and is offered by him as a service to members of ASTE at the nominal charge of \$1. Of particular interest to tool engineers residing in California, the booklet will save hours of valuable time formerly spent copying old examinations which, until now, have been available only at public libraries.

Orders may be placed by writing to Mr. Gallichotte at 3531 Emerson St., Palo Alto, Calif. No booklets can be sent C.O.D.

**MARCH 31, 1954**

## Is the Deadline for Applying for ASTE's International Education Awards

A total of ten awards of \$700 each are being sponsored for fourth and fifth year students in Tool Engineering, Mechanical Engineering, Production Engineering, and Industrial Engineering who evidence interest and aptitude in one or more such subjects as: metal processing, plant layout, tool design, inspection and quality control, and manufacturing processes.

**Applications are available at:  
Engineering Schools and ASTE National Headquarters  
10700 Puritan Ave.  
Detroit 38, Mich.**

## Toledo Society Elects R. C. W. Peterson

At an organization meeting of the Engineering Society of Toledo held in December, ASTE's national secretary, R. C. W. Peterson, was elected treasurer of the newly formed group. Mr. Peterson is president and owner of Peterson Engineering Co. in Toledo.

The organization was established to promote the growth of engineering and allied arts and sciences, and also to aid the public in solving civic engineering problems.



Program speaker at the January meeting of the Hamilton District chapter was D. S. Craig, second from left, of Stevenson & Kellogg Co., Toronto. With him are: B. D. McAuley, far left, of the same firm; Clarence Bulmer, chapter chairman; John Snyder, first vice chairman; and H. B. Ward, secretary.

## Cincinnati Members Brave Zero Weather to Hear Kenneth Blake Discuss 'Dynatomics'

Cincinnati—Braving a near-zero temperature, 120 members and guests of the Cincinnati chapter turned out for the January 12 meeting at the Engineering Society headquarters. Program speaker was Kenneth R. Blake, technical director and president of Metalloid Corp., Huntington, Ind. He discussed the subject "Dynatomics—A New Concept in Metal Removal."

The dynatomics theory is based on the concept that any metal structure which is made up of crystals, consisting of an atomic pattern of the lowest lattice energy, will require the greatest amount of energy to produce rupture or parting of the metal such as is necessary in cutting.

Mr. Blake explained that in applying this theory to the machinability of two similar metals, one being hot rolled and the other cold rolled, the cold rolled will machine the easier because it has gained lattice energy during the cold rolling process and consequently less energy needs to be supplied to bring the lattice energy to the bursting point required in cutting.

In applying his theory to the geometry of cutting tools, both high-speed steel and carbide, he advocated much higher positive rake angles, front and side clearance angles to deform the least number of atoms and thus require the least amount of energy. This point proved to be a very controversial one among those present who were actively engaged in the study of metal removal.

Those in disagreement with Mr. Blake pointed out that tools ground in accordance with these clearance angles failed rapidly in service. He contended that such tools are ruined in attempted grinding at room temperature. He rec-

ommended grinding carbide tools at red heat with the use of vapor coolant systems such as those marketed by the Metalloid Corp.

While many disagreed in part or entirely with Mr. Blake's theory, the discussion which followed his speech showed that a great deal of thinking, far off the usual path, had been stimulated.

Among the guests at the meeting were Fred Vogel, editor of *Modern Machine Shop*, and Robert Kuntz, Robert Reif, Richard Kiniere, of the J. R. Kuntz Co., Dayton, Ohio, representatives of the Metalloid Corp.

At the chapter's December meeting, members heard a lecture on the use of wax in cutting compounds and drawing lubricants. Speaker for the evening was John A. Werner, sales engineer, S. C. Johnson & Sons, Inc., Racine, Wis. He explained why wax makes a better lubricant for many types of operations. Dinner and a movie preceded the technical program.

—Louis H. Schumann

## Ferro Awards Presented

The annual Bob Weaver award of Ferro Corp. was presented to four members of the company's personnel at a dinner held at the Union Club in Cleveland. Named as this year's winners are: Russell W. Frank, safety director, Ferro, Cleveland; Russell A. Whiteman, chief process engineer, Tuttle & Kift, Inc., Chicago; Bernard A. McDermott, Ferro plan manager, Nashville; and Edward J. Riley, foreman, stabilizing department, Ferro Chemical Corp., Bedford, O.

## Time Study Discussed at Hamilton ASTE Meeting

Hamilton, Ont.—Twelve new ASTE members were introduced to the Hamilton District chapter at the January 8 meeting held at Fischer's Hotel. The presentations were made by Chairman Clarence Bulmer.

A technical address on "Measurement and Time Study" was delivered by D. S. Craig, production engineer, Stevenson & Kellogg Co., Toronto. He described the development of a system of predetermined motion times which enables the trained user to engineer work methods to a known cost before an operation has been put into production.

This technique was originally developed to solve human relations problems arising from the use of stop-watch study and the personal judgment rating factor applied by the time study man. The system can also be used to determine and evaluate better methods, establish time formulas, and to evaluate purchased equipment and material from a labor consumption viewpoint, and for a number of other purposes.

Mr. Craig pointed out that this system, like any sound engineering technique, should only be applied by a well-trained analyst.

The chapter's December session was held at the Brant Hotel in Brantford. H. Stewart, assistant works manager, Pratt & Whitney Division, Niles-Bement-Pond Co., was the guest speaker. He discussed "Metallurgical Problems Relative to Machine and Tool Design," illustrating his material with slides.

—John Litwin

## Rockford Reports Past Chairmen's Night

Rockford, Ill.—It was Past Chairmen's Night for Rockford chapter on January 21 at Woodward Governor Corp. Auditorium. Some 450 members, including their wives, members of the American Institute of Electrical Engineers, and past chairmen attended the meeting.

Preceding the regular meeting, all past chairmen and current chapter officers met at the Mayflower Restaurant for dinner and social fellowship.

At the meeting which followed, the nominating committee, consisting of George Torrence, Bruce Lundgren and Karl Kayser, presented its slate of candidates for the election of 1954-55 officers who are: chairman—Robert Spengler; first vice chairman—Alfred Oman; second vice chairman—Joel Jannenga; third vice chairman—Walter Fraser; secretary—Ernest Norman; and treasurer—Marshall Samuelson.

## Maurice Ullman Wins Membership Award

Climaxing the recent membership drive staged by the Tri-Cities chapter, an award for securing the most new members was presented at the January meeting. A copy of the *Tool Engineers Handbook* was given to Maurice Ullman for his outstanding efforts by Louis Benson, chairman of the membership committee. Announcement was also made that free dinners would be given to all those ASTE'ers who recruit three or more new members.

The technical program featured a talk by Frank Zagar, vice president and general manager of Zagar Tool, Inc., Euclid, Ohio. His suggestions to improve multiple drilling jobs included reducing speed and feed to increase drill life and using more drills at one time to reduce drilling time.

—Earl Tenpound

## Rochester Records 144th Monthly Meeting

Rochester, N. Y.—Rochester recorded its 144th meeting on January 4. With some 100 members and guests in attendance, the list of candidates for office was presented by the nominating committee and new members were introduced to the chapter.

The speaker for the evening's technical program was introduced by Bill Kamold. S. Saul, Jr., general manager of Rack Engineering Co., talked on "Plant Management," paying special attention to engineering and materials handling. A thought-provoking discussion period followed and Don Kohler, chapter chairman, presented Mr. Saul with a token of the chapter's appreciation.

—Paul Bruno

## Ladies Night Tops Peoria January Calendar

Peoria—When Peoria chapter held its annual ladies night and dinner dance on January 23 at the Hotel Pere Marquette, a record crowd of 400 turned out for the event. Organ dinner music was provided by Sara Murdoch and Bob Baron's orchestra furnished dancing music.

The committee in charge of this year's festivities included Edward Weber, Lee Johnson, Olin Simpson, Harold Austin, Harold Baker, Wilbur McWilliams, William Bahnfleth, Jr. and Vic Shellschmidt.

Peoria reports that four new members have joined their chapter in the past month. They are: Harry McLinden, Paul Azbell, Lloyd Ravenscraft, and William Sanders. —Russ Saur



When Rockford held its Past Chairmen's Night, all current officers and past chairman attended a dinner before preceding the meeting. In the foreground, seated, are: Howard Nelson, and Ernest Seeborg. Seated at the back of the table are: Fred Swanson, Henry Ruehl, Robert Spengler, George Rigeman, Edward Dickett, Ken Lund, and William Moreland. Standing are: Donald Hawkinson, John Kinsey, Walter Lustig, George Johnson, Karl Kaiser, Bruce Lundgren, George Torrence, Fred Kampmeier, Leo Reuland, Alfred Oman, and Joel Jannenga.—Kenneth Hull



Zero weather and an eight-inch snow fall in Springfield, Mass. were no obstacle for 60 ASTE members who turned out January 11 to hear a talk by K. P. Martin, second from right, manager of the Hydroform Division, Cincinnati Milling Machine Co. With him are pictured: Peter F. Scott, first vice chairman; William F. Buckley, technical chairman; and Robert M. Dickson, chapter chairman. Also on the program was a film entitled "Optical Gaging." —George H. Foy, Jr.



A group of apprentices from Willamette Iron and Steel Corp., Portland, Ore., were inducted into the Portland chapter at the November meeting. The ceremony took place before a tour of the Willamette plant. From left are: Charles Michaels; Floyd Welliver; Walter Herdt receiving a certificate from Chairman Mel Nielsen; Ivan Reed; Glen Ross; Hugh Shivers; and Andrew Winters, membership chairman. In the back row are: Fred D. Mondin, superintendent of machine shops; Vernon Coleman; Robert Norton; Casey Vanderbom; Lester Maynard; Ronald Anderson; Richard Ordway; Alan Lewis; and Kelly Fox, first vice chairman of the chapter.—Mel Nielsen

## Meteorologist Speaks at Twin Cities Meeting

Minneapolis—Some 120 members and guests of the Twin Cities chapter met at the Covered Wagon for the first regular session of the New Year on January 6. Meteorologist J. R. Smith of General Mills, Inc., Minneapolis, was the guest speaker.

He addressed the group on the results of experiments made with the General Mills-made Skyhook Balloons, in which they send them aloft with instruments attached to record altitude and temperature. One released at Minneapolis was found in Spain and balloons sent up near the equator into high altitude temperatures read 80 degrees below Centigrade.

On December 2 members turned out, 106 strong, for Past Chairmen's Night at Jax Cafe. Chairman Eric Fasth opened the meeting by introducing Wallace Ahlberg, a past chairman, who in turn called upon other past chairmen to read reports to the secretary, treasurer and committee men.

Past Chairman Lauren Blanchard introduced the speaker for the evening who was John C. Hussey, Jr., of the sales department, American Tool Works Co., Cincinnati. Mr. Hussey's topic was "Hydraulic Duplicating Lathes as Machine Tools." —*Walter J. Comstock*

## Greater New York Hears Ralph E. Cross

New York City—Greater New York chapter held its January 11 meeting in the New York Times Bldg. The principal speaker was Ralph E. Cross, executive vice president, The Cross Co., Detroit. The title of his talk was "How to Get the Most Out of Capital Expenditures."



The Springfield, Ohio, chapter held its fourth annual Executives Night on January 12 at the Springfield Country Club. Swan Bergstrom, vice president, Cincinnati Milling Machine Co., Cincinnati, was the principal speaker. Shown are, left to right: Joe Charters, chairman of the Executives Night committee; Don Garrett, second vice chairman; R. L. Melchi, program chairman; R. C. Montanus, chapter chairman; Mr. Bergstrom; Andrew Reeb, treasurer; and Chester Anderson.

## West Point Army Officer Discusses Ordnance

Poughkeepsie, N. Y. — Approximately 100 members and guests of Mid-Hudson chapter heard Col. John J. Billingsley, professor of ordnance, United States Military Academy, speak at their January 12 meeting at Nelson House.

Col. Billingsley chose as his topic "Ordnance Material—Conception to Battlefield." He covered the various phases required to produce an item for the Armed Services. He noted that the Field Service Division of Ordnance is the largest distribution service in the world, handling more than 400,000 separate items. In closing, Col. Billingsley pointed out that approximately four years is required from the conception of an idea on a draft board or in research laboratories to the actual delivery in quantity of a major weapon to the Armed Services.

Prior to the technical talk, J. Ernest

Doolittle, director of Civilian Defense, gave a coffee talk on "The Part the Citizen Plays in Civilian Defense."

A new class in basic engineering began on January 20 and will run for 16 weeks. The weekly sessions last two hours and 40 minutes.

Four new members were introduced to the chapter at this meeting. They were: Franklin G. Knapp, Donald Ross, Abraham Weiss and Louis Voerman.

—*Harold J. DePew*

## Robert Dickson Joins Hatfield Firm

Robert M. Dickson, chairman of the Springfield, Mass. chapter for 1953-54, is now associated as an engineer with the Porter-McLeod Machine Tool Co., Hatfield, Mass. He was formerly with the American Bosch Corp.



A plant tour of Boeing Airplane Co. on Saturday, January 16, drew an attendance of 90 Wichita ASTE members who

saw the B47 in all stages of manufacture. Eight Boeing members of the chapter acted as guides. —*J. G. Temple*

## Toronto Chapter Tours A. C. Wickman, Ltd.

Etobicoke, Ont.—Toronto chapter's regular monthly meeting was a scheduled two-day plant tour of A. C. Wickman, Ltd., Etobicoke. To make the plant tour more effective, half the chapter visited Wickman on January 7, and the remaining members toured it on the 8th.

Buell Manning, Wickman sales manager, greeted the visitors on behalf of the company, after which the groups viewed two films. One film concerned the manufacture of carbides and the application of carbide tools, and the other illustrated carbide tools at work.

Members saw the basic steps in manufacture of carbide as they toured the plant. Carbide is molded under pressure, presintered to chalk-like consistency, machined to form (if necessary) and sintered. The chapter saw a hydraulic press and pill presses forming blanks and tips, presintering and sintering furnaces, and the tip cutting shop. The fabrication of Wickaloy tools was also demonstrated, including brazing, grinding and lapping. Brush surface finish testing equipment was also demonstrated and the evening ended on a social note.

—A. McKinney Rice

## K. P. Martin Addresses Erie Chapter Meeting

Erie, Pa.—More than 50 members and guests attended the Erie monthly meeting at the Sportsmen's Athletic Club on January 5. Kenneth P. Martin, assistant manager of the Machinery Division, Cincinnati Milling Machine Co., gave his talk on the "Hydroform—New Kind of Machine Tool," well-known to many ASTE chapters across the country. He gave his talk with the assistance of slides and samples of work, and an interesting question and answer period followed.

—H. W. Sedler

## Louis Joliet Reviews Materials Handling

Joliet, Ill.—More than 120 members and guests of Louis Joliet chapter met at the Terrace Room of Woodruff Hotel on January 19. Paul Youngdahl, Mechanical Handling Systems, Inc., Detroit, spoke on material handling methods. He used an automatic washer and dryer plant as an example of savings that could be made resulting in increased production.

—Clifford Berglund



Howard C. McMillen, third vice president of ASTE, was guest of the Louisville chapter on January 12. Program technical speaker was J. R. Reinertson, manager midwest division, Pivot Punch & Die Corp., Chicago, and his topic was "Perforating Dies." Shown are: from left, George H. Wilhelm, first vice chairman; Mr. Reinertson; Robert S. Lenz, chairman; Mr. McMillen; and James R. Davis, chairman; Mr. Bergstrom; Andrew Reeb, treasurer; and Chester Anderson.

## Metallurgist Talks on Cutting Tools

Providence, R. I.—At a dinner meeting held at Johnson's Hummocks, 47 members and guests of Little Rhody chapter heard Dr. William Frazer, chief metallurgist, Union Twist Drill Co., Athol, Mass. His talk "Cutting Tools—Recent Developments," stressed that progress in America has been the result of open-mindedness on the part of manufacturers of like articles and the sharing of information.

He elaborated on the results of testing conventional HS Steels used for 50 years and super HS Steels used for the last 10 years, explaining in detail effects of chemical, temperate and grain changes with regards to toughness. Cutters with high rake angles were exhibited to the group. —M. A. Shoo

## Glen Stimson Presents Program at Albuquerque

Albuquerque—Members and guests of the Albuquerque chapter met at Leonard's Restaurant for their January 14 meeting. Preceding the technical session, Arthur Miller, nominating committee chairman, announced the slate of officers for the 1954 election.

Glen H. Stimson, chief gage engineer, Greenfield Tap and Die Corp., Greenfield, Mass., presented the technical program. He showed the film "Facts on Taps and Tapping" in full color, and extreme slow motion, showing metal deformation and action of tools in use. He enlarged upon the subject in the discussion period which followed the film. —H. E. Anderson

## Locating Principles Topic of J. I. Karash

St. Catharines, Ont.—The first monthly meeting of the New Year for Niagara District chapter was held at the Queensway Hotel. Seventy members and guests heard J. I. Karash of the Reliance Electric Co., Cleveland, Ohio.

In his talk, "Principles of Locating," Mr. Karash emphasized the importance of positioning the plane of the work in the design of jigs and fixtures and also how to eliminate "jamming."

—William Yaeger

## Twin States Speaker Discusses Atomic Energy

Springfield, Vt.—Charles V. Moore addressed some 75 members and guests of the Twin States chapter at the Trade Winds Cafe on January 13. Mr. Moore, a design engineer in the reactors unit of the Knolls Atomic Power Laboratory, General Electric Co., Schenectady, N. Y., talked to the group on "Atomic Energy for the Layman."

His talk was devoted to fissionable material, the operation of nuclear reactors and atomic piles, stressing all through the discussion the extreme care and complexity of handling materials. Perhaps the most interesting feature of the program to members was the illustration of actual machining operations powered by atomic energy. Supplementing Mr. Moore's talk was the film "A is for Atom," showing the composition of the atom and the basic principles of atomic energy.

—Maurice E. Blais



The camera's eye caught these members of the Richmond chapter next to a 500-ton press on their tour of Rex Manufacturing Co., Connorsville, Ind. From left are: C. Minor; G. Sweigart; V. Driver; Carl Vail, treasurer; R. W. Hull, vice president in charge of engineering, Rex Manufacturing; C. Brewer; C. Van Ausdall, first vice chairman; G. Shimer, secretary; L. Fabian, membership chairman; and P. Perrine.—E. L. Hale

## Annual Parties Highlight Calendar

Music, dancing, prizes, dinner and fellowship seem to be the main ingredients for ASTE parties held in December.

Evansville members and guests came out 150 strong for their annual ladies night. Entertainment was provided in the form of an impersonator and a one-act play, "George," described as a sophisticated comedy. The couples danced until midnight and a good time was had by all, reports Guenther F. Wulf.

Golden Gate's Christmas party at the Columbo on December 4, attracted 667 members and guests, thought to be the largest engineering group to attend a social or technical gathering in the San Francisco Bay area, according to Philip R. Freeman.

Over 500 St. Louis revelers attended their annual Christmas party. The gala evening took place at Sheraton Hotel Ballroom on December 18. Special guests were: Willis G. Ehrhardt, a na-

tional director of ASTE; and J. J. Demuth, past national president of ASTE. Another guest was Santa Claus, says E. Graser, Jr., editorial chairman.

San Fernando Valley chapter members and their wives held their Christmas party on December 11 at Hody's Restaurant, North Hollywood, Calif. ASTE Member Jack Smith led the orchestra for dancing couples and Dr. Jose Fernando Machade gave numerous impersonations in the humorous vein. A somber note was added to the evening by Dr. J. L. Moriarty, who spoke to the group on the evils of narcotic addiction. More than 300 turned out for the evening according to Cyril D. Colvey, editorial chairman.

## Past Chairman Urges Professional Registration

Lancaster, Pa.—Past Chairman Joseph Resser, Sr., stressed the importance of all members becoming registered professional engineers at the January 12 meeting of Greater Lancaster chapter held at Arcadia Cafe.

The business session also included distribution of ballots to the members for selecting candidates to be on the National Board of Directors, and an announcement by Chairman Ray Moorehead that the nominating committee would present a slate of officers for the coming year at the February meeting.

"Multislide Presses" was the topic of a talk by A. Melnick, chief tool engineer, U. S. Tool Co., Inc., Ampere (East Orange), N. J. He displayed and discussed many sample parts produced by multislide presses.

—George J. Coil

## Glen Stimson Speaks on Tapping and Gaging

Tucson—Featured speaker at the January meeting of the Tucson chapter was Glen H. Stimson, chief gage engineer, Greenfield Tap & Die Corp. His topic was "Facts about Taps and Tapping." The program also included movies and slides which illustrated screw thread errors and methods of gaging.

About 50 members and guests attended the meeting which was held on the campus of the University of Arizona.

—J. W. Vincent

## Lehigh Valley Chapter Reviews Powdered Metals

Allentown, Pa.—Hotel Traylor was the scene of Lehigh Valley chapter's meeting on January 15. Malcolm F. Judkins, manager of the New Products Division, Firth Sterling, Inc., Pittsburgh, talked to the assembled group on "Powdered Metal and Titanium." He outlined the vital role that powdered metals and titanium are playing in the U. S. defense program, being the raw materials used in the manufacture of numerous jet engine, rocket and electronic tube components.

In regards to titanium, Mr. Judkins pointed out the many uses to which it has been put because of its strength and heat resistant qualities brought about by the process of powdered metal-lurgy.

On December 18, members and guests of the chapter met at Hotel Traylor to hear William S. Thomas, vice president and general manager of Emmaus Foundry and Machine Co., Emmaus, Pa. His talk covered shell molding.

—George W. Savitz

## Metal Removal Discussed by Dr. Horace Frommelt

Peterborough — Dr. Horace Frommelt, consulting engineer, was the technical speaker at a Peterborough program sponsored January 7 by Detroit Milling Cutter Co. and Carbology Department of General Electric Co. His topic was "Metal Removal by Milling."

Dr. Frommelt, a former professor of mechanical engineering at Marquette University and head of the school's department of mechanical engineering, gave a highly educational talk on the origin of the milling process and its advances through the years.

Proper setups, speeds and feeds were stressed in his presentation and the advantages of recent new designs of milling cutters were clearly defined. Colored slides in 3-D showed typical applications of improved milling techniques.

The technical session and dinner which preceded it were attended by 52 members and guests. —F. H. Mason

## Scholarship Fund Aided by Milwaukee Party

A record crowd of 550 attended the annual Milwaukee dinner dance, held to raise money for the chapter scholarship fund. Members and guests dined and danced at the Milwaukee Elks' Club on January 16.

—Walter Behrend

## Discusses Versatility of Hydraulic Presses

Fort Worth, Texas—"The Hydraulic Multipress" was the topic of discussion during the technical session of North Texas Chapter's meeting on January 8 at the Amon Carter International Airport.

Melvin G. Sulser, regional sales manager, Denison Engineering Co., Columbus, explored the entire field of hydraulic press cutting and forming applications. The presses' versatility was aptly shown in several films. Equipped with automatic cycling, the presses could press, rivet, crimp, broach, stake and assemble progressively if several of them were working in unison with one another.

—F. Paul Simpson

## Racine Members Hear Research Engineer

Racine, Wis.—"Flame Plating with Tungsten Carbide" was discussed at the January meeting of the Racine chapter by R. O. Wyland of the Linde Air Products Co., Indianapolis, Ind. Mr. Wyland has been engaged in research work on Linde's flame plating process at Speedway Laboratory.

He described the new method of applying thin coatings of tungsten carbide and other materials, supplementing the program with slides to illustrate some of the applications of the new process. Questions and answers followed in a lively discussion period. Close to 100 members attended the meeting.

On December 7 the ASTE program featured a talk on quality control made by John A. Harrington, chief engineer, DoAll Co. He presented a detailed discussion on the lack of conformity and uniformity in measurements.

—Charles P. Nelson



Harry Gotberg, left, vice president of engineering, Colonial Broaching Co., Detroit, discussed modern broaching methods at Long Beach chapter's January meeting. With him is Carroll B. Edson, first vice chairman of the chapter. Also on the program were Leo Gable and John Sprinkel, faculty members of Long Beach City College, who spoke on tool engineering training. About 100 members were present.

—J. J. Smith

## Two Talks Featured on Fond du Lac Program

Sheboygan, Wis.—Fond du Lac chapter held its January 8 meeting at the Sky Garden Room in Sheboygan, Wis. Two speakers highlighted the technical session. "Metal Castings" was the topic chosen by E. W. Wussow, foundry manager, Kaukauna Machine Corp., Kaukauna, and W. T. Schmidt, supervisor of patterns and castings, Giddings and Lewis Machine Tool Co., Fond du Lac.

The speakers discussed the techniques that are used in the manufacture of cast iron and in the manufacture of patterns for these castings. After briefly discussing the history and development of the various casting techniques, both men described in detail the limitations of casting techniques and pattern design and cost reduction.

—Robert M. Hanson

## National ASTE Officers Visit Toledo Chapter

Toledo—Past President L. B. Bellamy and First Vice President Joseph P. Crosby were honored guests at the December 9 meeting of the Toledo chapter. About 70 members were on hand to greet them at a dinner and technical session held at Maumee River Yacht Club.

The visitors were introduced by R. C. W. Peterson, national secretary of ASTE. Mr. Crosby gave a short talk on national Society activities, highlighting the forthcoming Industrial Exposition and Annual Meeting slated for Philadelphia April 26-30.

The history of broaching and the application of broaching to jet engine production was covered in a lecture by James W. Dopp, service engineer, Lapointe Machine Co. The talk was followed by a film on the latest developments in broaching machines.

As a special feature of the meeting, affiliate membership plaques were presented to Peterson Engineering Co. and Rold Rit Metal Products Co.

On December 15 the chapter toured the information center and long distance facilities of the Toledo Bell Telephone Co. The company houses the nation's largest television monitoring center.

—James F. Sullivan

## Nashville Members Meet with ASME Chapter

Nashville—At a joint meeting with the ASME chapter, Nashville ASTE members heard a lecture by Robert N. McGee, special sales representative of Jones & Laughlin Steel Corp. The January 19 session was held at Alumni Hall on the campus of Vanderbilt University. Seventy members of the two technical societies attended.

—J. E. Wilkinson



More than 160 members and guests of the Indianapolis chapter attended the January program on applications of punching and die work done by Midwest Pivot Punch & Toolset Co. The firm's manager, Jerry R. Reinertson, was



the speaker. Displays were set up at 4:30 p.m. for early-comers and the evening agenda included the lecture and slides on punches and dies at work. First Vice Chairman Joe Enright conducted the meeting. —M. B. Rosenbarger

## Position Wanted

**ENGINEER**—with executive experience wishes to represent industrial firm in sales capacity. Willing to travel. Experience includes aircraft tool of all types, precision and assembly tools. Have also handled all phases of tool designing, product designing, processing and manufacture in this field. In the automotive field, my experience has been tool designing, dies, estimating, machine parts, and stamping. For complete resume write to Box 090, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

## Positions Available

**TOOL AND DIE SALESMEN**—Must be experienced in tool and die design with some sales experience. Prefer men who have already established themselves in the field. Write details of your background to: Box 112, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

**CHIEF ENGINEER**—for small but successful tool and special machinery builder located within 100 miles of Chicago. He must have a good knowledge of engineering fundamentals, shop practice, and machine tools. Must be able to work on the board and originate good designs, working alone or with others. We want a key man on whom we can base a substantial expansion. Write to Box 110, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

**TOOL ENGINEER**—required for interesting work in connection with the sale and application of HEB hydraulic copying lathes. Must have good knowledge of modern production methods especially turning with carbide tools, and should have some processing experience. Write: H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York, N. Y.

**SUPERINTENDENT FOR COLD ROLL FORMING DEPARTMENT**—Must be capable of estimating from section drawing and supervising roll layout, manufacturing and testing. Permanent position with established manufacturer. Write: Box 111, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

## TOOL AND MACHINE DESIGNERS—

One of Cincinnati's largest permanent design firms has openings in their own office for experienced machine, product and tool designers, and detailers.

Recent engineering graduates or students will also be given consideration. These are permanent positions with a substantial, stable leader in the field. We can offer top starting wages, modern working conditions, paid holidays, vacations, and other benefits. Our policies assure varied experience and unusual opportunities with a future.

New employees would be expected to settle on a permanent basis in Cincinnati. Please send resume to Cincinnati Designing, Inc., 8120 Blue Ash Ave., Cincinnati 36, Ohio.

## High Velocity Turning New Orleans Topic

New Orleans—The regular monthly meeting of New Orleans chapter was held at Tulane University on January 12. The technical program featured a talk by Ed H. Wells of Jones & Lamson Machine Co., Springfield, Vt., and a technicolor film on "High Velocity Turning."

The film showed metal being turned from 150 to 2400 surface feet per minute, photographed at 3000 frames per second. Various photomicrograph structure of finished workpieces when turning at low cutting speeds, and a chart showing the results of the measurement of cutting tool forces also were seen.

The coffee speaker was Paul Kalman, WDSU-TV sports commentator, who gave a rundown on fishing in Louisiana, both salt and fresh-water, revealing how and what to use to catch the elusive marine creatures.

## Chief Engineer Presents Los Alamos ASTE Program

Los Alamos—"Facts about Taps and Tapping" was the subject discussed at the January meeting of the Los Alamos chapter. Nearly 60 members heard the technical talk made by Glen H. Stimson, chief engineer, Greenfield Tap & Die Corp.

His program concerned the new unified thread standards and their interchangeability, and common tapping and gaging errors. An interesting question and answer session and a sound and color film rounded out the meeting. Among the guests at the meeting was E. J. Gray, Pacific coast manager for Greenfield.

—H. J. Von Steeg

## Two Speakers Highlight Granite State Program

Rochester, N. H.—Members and guests of the Granite State chapter met December 8 to hear a dual discussion. Robert I. Belmont, New England sales manager, and Albert L. Ball, director of research, Bay State Abrasives Products Co., Westboro, Mass., were the speakers.

Mr. Belmont presented the practical viewpoint and Mr. Ball gave the technical side on application of abrasives, grinding theory, types of abrasives available and toolroom and production grinding. They discussed the advantages of mist grinding, a modern method whereby a coolant is sprayed on the wheel with a low pressure of compressed air.

—C. P. Radwan



At Fort Wayne chapter's January meeting, Joseph P. Crosby, left, first vice president of ASTE; Donald D. Welbaum, chapter chairman; and J. W. Dopp, service engineer, Lapointe Machine Tool Co., discussed some of the exhibits which illustrated the technical address on broaching for jet propulsion made by Mr. Dopp. The coffee talk was delivered by Mr. Crosby who spoke on the relationship between chapter and national ASTE activities.—Richard Spaul

## P. R. Marsilius Speaks at Piedmont Chapter

Greensboro, N. C.—On January 11 members and guests of the Piedmont chapter met at Bliss Restaurant for their regular monthly meeting. Some 62 were present when P. R. Marsilius, vice president and sales manager of Producto Machine Co., Bridgeport, Conn., presented a talk on "The Expanding Tool and Die Industry."

Mr. Marsilius spoke mainly in his capacity as treasurer and director of the National Tool and Die Manufacturers Association, emphasizing the importance of tool and die making in our present economic system. He pointed out that while one of the United States' strong points is product designing, no product can be economically produced unless the tool designer and the tool and die maker are on their toes. He strongly advocated the need for a greatly increased apprentice program, for the trade school level on up, as good tool and die makers are becoming a scarce commodity. He augmented his talk with the film "Tool and Die Making—Keystone of Mass Production."

—Henry H. Palmer

## K. P. Martin Heard at Atlanta Meeting

Atlanta—"Hydroform—A New Form of Machine Tool" was the topic of Kenneth P. Martin when he spoke at the January 18 meeting of the Atlanta chapter. Mr. Martin is manager of the Hydroform Division of Cincinnati Milling Machine Co.

He said that, in general, Hydroform is a short-run production process rather than a mass production expedient, although in some cases it has been employed in the rapid and repetitious manufacture of parts. Considerable emphasis was focused on the fact that Hydroform is capable of forming parts with a lesser number of interposing annealing steps than by the conventional steel die method. The process is particularly valuable as a first-step breakdown preparatory to final shaping in steel dies.

—Joe L. Morris

## L. N. DeVos Promoted

Leon N. DeVos, Detroit ASTE member and a technical author for THE TOOL ENGINEER magazine, has been named sales representative for the state of Michigan, excluding Wayne County, for Vinco Corp. He has been with the firm since 1940.



Kenneth P. Martin, third from left, spoke to 80 members and guest of the Atlanta chapter at the January meeting. Pictured with him, from left, are: Julian Cowen and Ralph Almand of Chandler Machinery Co., Don Lawless, Maynard Stapp, Mel Nowlin and Ben Stinnette of Cincinnati Milling Machine Co.

## Five-Point Education Program Calls for Distribution of Technical Magazines

Canton, Ohio—On December 17 Canton chapter held a dinner and technical meeting at the American Legion Home. Robert Aikenhead, chief die engineer for the E. W. Bliss Co., spoke on the engineering problems of the heavy duty super draw dies and their application to the giant presses being manufactured today. He also showed a movie in sound and color entitled "Tool and Die Making," produced for the National Tool and Die Manufacturers Association.

Canton's education committee has set up a five-point plan for its first year of activity as an ASTE chapter. Present goals are: one—to acquire trade magazines from plants that would ordinarily

be discarded, and have them distributed to schools in the area; two—to finance the purchase of five ASTE *Tool Engineers Handbooks* to be donated to schools and libraries in the area and to provide funds for five student memberships; three—to invite one or two students or persons in the field of tool engineering to be their guests at monthly meetings in order to give them an idea of ASTE functions; four—to provide speakers for schools and organizations desiring technical knowledge on tool engineering; and five—to promote a scholarship fund to send some deserving student to an accredited technical institution.

—G. C. Hornbeck



Shown at Canton's December meeting are: Virgil Shelton, first vice chairman; Robert Aikenhead, guest technical speaker; Carl Smith, chapter chairman; J. L. Nickas, program chairman; E. B. Hubert, co-chairman of the program committee; and Lloyd Dickerhoof, treasurer.

## Arc Machining on Boston Program

Boston—The New England Mutual Hall was the scene of the Boston January 14 meeting attended by some 100 members and guests of the chapter.

"The Art of Arc Machining" was revealed by H. V. Harding, technical assistant to the president, Elox Corp. of Michigan. Mr. Harding, with 12 years of experience in the field, explained many unusual applications of the processes which lend themselves to the machining of hard-to-machine metals. He augmented his talk with color slides.

Arthur Carrey of the Bell Laboratories talked about the new and much advertised "Solderless Connection."

On the lighter side, Past Chairman Prescott Smith spoke of his trailer trip vacation to Alaska. With the use of colored slides, Prof. Smith narrated his experiences through the Northwest and up the Alcan Highway.

—Harry Midgley

## Atlanta Hears About Essentials of Sawing

Atlanta—The Atlanta chapter heard George W. Sheppard, director of research, The DoAll Co., Boston, present a talk on the "Essentials of Sawing" at the December meeting. Mr. Sheppard's talk was devoted to classification of materials to be sawed and the characteristics effecting sawability.

He emphasized the importance of selecting the right saw band for a specific material. He also talked about super fine slotting circle cutting and shaping along with the value of coolants and lubricants as applied to sawing. Slides were used to illustrate the presentation.

—C. E. Redfern



Harry Evans, right, of the San Diego Chamber of Commerce, was the principal speaker at the January 13 meeting of the San Diego chapter. He discussed future allocated sites for light manufacturing in the area. Pictured with him is Chairman Arthur E. Crom.

## Houston to Distribute Society Magazines

Houston—As a result of the increased demand for copies of THE TOOL ENGINEER in the public schools, Houston's ASTE chapter has mapped out a definite program to collect old copies of the magazine for distribution to the various high school libraries. The program was established January 19 at a meeting of the ASTE executive committee, following a discussion led by Charles Hay who said that the need for additional magazines in the schools was exceptionally great.

An interesting sidelight was offered by H. E. Collins, national treasurer of the Society. He reported an incident concerning an 11-year-old in his neighborhood who was collecting old newspapers and magazines. The youngster stated that copies of THE TOOL ENGINEER are never sold because they were in such demand at the schools.

—M. M. Wiseman

## Hartford Members Meet with ASLE Chapter

Hartford—December 7th found members and guests of the Hartford chapter enjoying a Father, Son and Daughter Night at the City Club. The program included a talk by Robert M. Shultz, superintendent of recreation for the city of Bridgeport, Conn. He spoke on the lives and times of Bavarian youth, illustrating his subjects with color slides. Old-time movies were also shown.

On December 1 ASTE members met with the Hartford chapter of the American Society of Lubrication Engineers at the Indian Hill Country Club. Featured speaker at the joint session was Dr. M. Eugene Merchant, assistant director of research at the Cincinnati Milling Machine Co. His topic was "Measuring Tool Life by Radioactive Means Using Isotopes."

—A. Douglas Proctor

## Melvin Verson Talks to Fox River Chapter

St. Charles, Ill.—Some 80 members and guests of the Fox Valley convened at the Baker Hotel for their first meeting of 1954 on January 5. The program was highlighted by the technical talk delivered by Melvin D. Verson, executive assistant, Verson Allsteel Press Co., Chicago. He was assisted by Walter C. Johnson, also of Verson Allsteel.

The program consisted of colored movies demonstrating five station transmat presses making refrigerator trays and washing machine legs on one operation. He also showed pictures of hydraulic presses using rubber pads for forming aluminum parts for the airplane industry.

—Willard C. Perkins



These 140 tool engineers recently completed an eight-week refresher course in engineering offered at California Western University in cooperation with the San Diego ASTE chapter. Special certificates were presented to the graduates by Dr.

William C. Rust, university president. ASTE Vice Chairman Jack McClure represented the chapter in the organization of the course which was the first one of its kind sponsored by the university.

—William Keller



E. C. Rork, plant manager, and Paul S. Anderson, sales manager of the Arcturus Mfg. Corp., Venice, Calif., were the technical speakers at the January 14 meeting of the Los Angeles chapter. Their subject was "Forging to 0.010-Inch Tolerances." Chairman Carl L. Almquist introduced the speakers.

## Saginaw Valley Chapter Gives Awards to General Motors Institute Students

Frankenmuth, Mich.—Saginaw Valley chapter members and guests, numbering 120, gathered at Zehnder's Hotel for their meeting on January 21. The business session was lengthier than usual with the presentation of the nominating committee's report and the yearly scholastic awards.

The nominating committee presented a slate of officers for 1954 consisting of chairman—A. W. Blackmon; first vice chairman—S. A. Matthews; second vice chairman—C. E. Bierworth; secretary—H. W. Snider; treasurer—Peter Duch; and delegate—D. A. McMillan.

Three juniors at General Motors Institute, Flint, received the scholastic awards of ASTE Handbook, ASTE pin and one year's ASTE membership. They were: Wayne Walworth, Warren L. Hart and Robert Wagborne.

At the same time the announcement of the award for the most outstanding fifth-year project in the field of tool engineering at GMI was made. Helmut C. Heuser wrote a report entitled "Diamond Versus Electrolytic and Electroerosion Grinding of Carbide." Mr. Heuser, now in the US Army, will receive his Handbook, ASTE membership, pin, and free dinner tickets to the chapter meetings for a year upon his return.

Associate Professor A. McKee of the University of Michigan and member of the National Education Committee, spoke on the development of the tool engineer as a man, including remarks about the educational background.

Technical speaker for the evening was Ernest F. Hohwart of the N. A. Woodworth Co., Ferndale, Mich. Mr. Hohwart gave a brief talk on some of the problems associated with accurate precision chucking. He alluded to his experiences as an apprentice in Germany and gave a detailed account of his company's diaphragm chucks, theory and actual performance to date. —*Kent B. Arnold*

## Chautauqua-Warren Hears C. E. Herington

Warren, Pa.—Members and guests of the Chautauqua-Warren chapter turned out, 93 strong, for the first meeting of 1954 at the American Legion Club on January 21.

C. E. Herington of Meehanite Metal Corp., New Rochelle, N. Y., took over the podium as guest technical speaker. He presented a program on "Meehanite Metal as a Material for Forming and Stamping Dies." Augmenting his talk, Mr. Herington showed sound film slides and a 16mm sound film entitled "Meehanite Metals." The film catalogued the various types of Meehanite metal and a unique method of noting its substance as "a material which bridges the gap between iron and steel, and combining the best qualities of both."

Special guests at the meeting were E. Gasner, president of the American Foundrymen's Association and W. J. Iekel, Buffalo chapter chairman.

—*Laurence R. Green*

## New Engineering Center Planned for Cleveland

Exemplifying the growth and importance of engineering in the industrial northeastern Ohio area, a \$1,378,000 building and development program for the construction of a new downtown Engineering Center has been announced by the Cleveland Engineering Society. The Cleveland ASTE chapter is affiliated with the organization.

Plans for the project, which will be completed as the Society prepares for its 75th anniversary, have been outlined at a number of special meetings for the membership and the area's industrial leaders.

To be known as the Cleveland Engineering Center, the two-story structure will be of contemporary design and will provide facilities aimed at making it the focal point of all engineering activities in the area.

Providing a sharp contrast in design, size and facilities, the modern building will replace the CES headquarters at 2136 E. 19th St. The Drake Hotel, presently occupying the site of the proposed center, is to be torn down.

## Threading Discussed at Pittsburgh Meeting

Pittsburgh—Speaker G. M. Stickell, vice president of Landis Machine Co., Waynesboro, Pa., presented a talk on "Threading" at the January 8 meeting of Pittsburgh chapter at the Sheraton Hotel. More than 100 members and guests were present.

He stressed that since threading is such a vast subject, it is impossible to go into great detail on any one method. He also emphasized that considerable study must be made of each application before the proper method can be determined. —*E. L. Caughey*

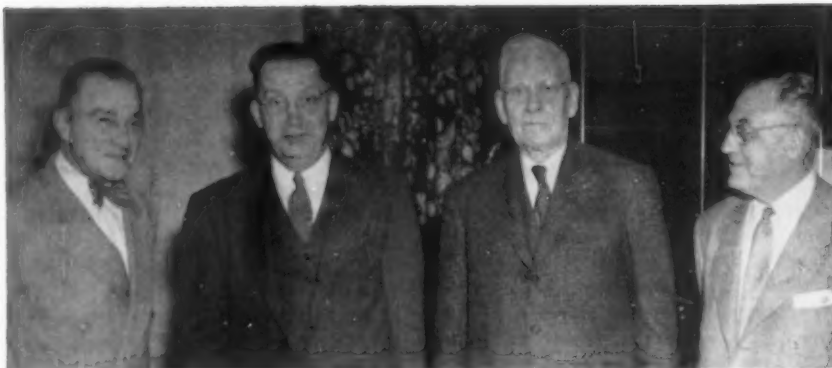
## ASTE Chapter Meets with Welding Society

York, Pa.—Central Pennsylvania chapter held a joint meeting with the Welding Society of York during January at the West York Inn. A total of 70 engineers attended the meeting.

George F. Brumbach, chief of customers development work division, Carpenter Steel Corp., Reading, Pa., was the technical speaker. He addressed the group on "Air Hardening vs. Oil Hardening of Steels."

The joint meeting is part of the chapter's effort to establish a York Engineering Council in the near future.

—*Paul F. Leese*



Four special guests shared the spotlight at the Springfield, Ohio, meeting in January. From left are: J. J. Demuth, national past president; Werner I. Senger, vice president of Gisholt Machine Co., Madison, Wis., the speaker; I. A. Weaver, president of Weaver Manufacturing Co., Springfield; and Willis Ehrhardt, current national director of ASTE. Photograph by Earl T. Kane

### Gisholt Vice President Speaks on "Balancing"

Springfield, Ill.—Willis G. Ehrhardt, a national director of ASTE, was a special guest of the Springfield chapter at its January 5 meeting. He described ASTE's coming industrial tool exposition and annual meeting, urging members to attend if possible. Other important visitors were J. J. Demuth, a national past president of ASTE, and I. A. Weaver, president of Weaver Mfg. Co., Springfield.

At the business session of the meeting, the members elected a nominating committee for the coming elections. Robert Peek was named chairman of the committee and was assisted by Roger Wallace and C. T. Moe. Tom Harden, chairman of the membership committee, announced that the current membership drive had ended and that Robert Waters had been awarded a *Tool Engineer Handbook* for bringing four new members into the chapter.

The technical portion of the program was presented by Werner I. Senger, vice president in charge of balancing, Gisholt Machine Co., Madison, Wis. He explained the importance of balancing rotating parts and emphasized that the higher the rotating speed of a machine member, the more critical the matter of balancing becomes.

Mr. Demuth presented a color movie entitled "Tool and Die Making—Keystone of Mass Production," courtesy St. Louis Ehrhardt Tool and Machine Co.

The film was produced for the National Machine Tool Builders Association and has been shown throughout the country as part of the organization's program to help engineers and laymen alike become better acquainted with the nation's production facilities for tool and die making. —Charles Collier

### McMillen Presents Evansville Award

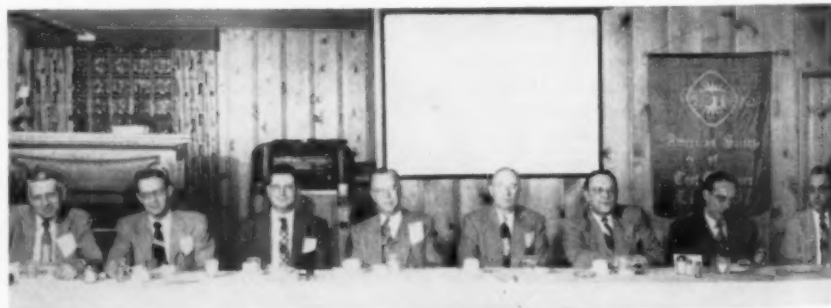
Evansville—On December 14 Evansville chapter held its annual Executives Night, instigated to acquaint industry and executives with the functions of ASTE. The event took place at Hadi Shrine Temple and some 97 members and guests turned out.

Special guest of the evening was Howard C. McMillen, third vice president and national director of ASTE, who awarded a past chairman's pin to Henry J. Pernicka.

Dr. Frank C. Hockema was the guest technical speaker. Dr. Hockema, vice president and executive dean of Purdue University, Lafayette, Ind., spoke on the subject "Meeting Industry's Future Requirements in Engineering." He explained what educators can do to help industry and what industry can do to help educators prepare engineers for work in their respective fields.

Entertainment in the form of fine musical harmony was provided by the Treble Tones, a female barbershop quartet.

—Guenther Wulf



Sixty-five Lima ASTE members and guests were on hand January 21 for a technical program on "Latest Developments in the Turning Field." Seated at the head table were: W. J. James, secretary; H. W. Carey, second vice chairman; R. E. Fromson, first vice chairman; Mr. Robinson, representative of the Monarch Machine Tool Co.; A. E. Feightner, chairman; S. A. Brandenburg, vice president for Monarch; William Epley, program chairman; and J. E. Kuck, treasurer.

### Brandenburg Addresses 65 Lima Members, Guests

Lima, Ohio—S. A. Brandenburg, vice president in charge of sales, Monarch Machine Tool Co. of Sidney, Ohio, was the guest speaker at Lima chapter's January meeting. He presented a discussion and two films on new developments in the turning field.

Three new members, Joseph Weigel, C. D. Outland and James Linhart were introduced at the meeting by John Rentz. Candidates for the chapter election were reported by the nominating committee. Gene Seifert, chairman, and Ralph Arlin and Don Filter made the selections.

Guests present included: R. C. Sauber, Toledo ASTE member, John Weisner, Cleveland member, Ed Murphy, A. P. Shield, Tom Bucher, George Arensman, Joel Kimmel, Herb Ostenkamp, Virgel Meyers, John Meyers and Lyle Udall.

—Donald Cox

### Retirement Shunned by M. R. Churchill

One of ASTE's oldest members, Myron R. Churchill of Saginaw, Michigan, has come up with a new precision measuring and gaging instrument which has found quick acceptance, especially in the manufacture of hydraulic cylinders which have "O" ring and snap ring grooves, and other difficult-to-measure recesses.

This inside diameter measuring instrument will be marketed by Mutual Engineering Service under the trade mark "Diametrick."

Mr. Churchill, widely known throughout the midwest as an industrial research engineer, tried to retire four years ago at the age of 70, but is now back as head of his old organization at Saginaw. During World War II, he was chief of engineering at the Detroit Ordnance District Gage Laboratory.

## Directory of ASTE Chapter Chairmen and Meeting Nights

- AKRON**, Third Tuesday, F. A. Flannery, 211 Edgerton Rd., Akron, Ohio.
- ALBUQUERQUE**, First Friday, H. P. Backer, 1721 Ridgcrest Dr., Albuquerque, N.M.
- ATLANTA**, Third Monday, C. D. Toney, Jr., 774 Dill Ave., S.W., Atlanta, Ga.
- BALTIMORE**, First Wednesday, D. E. Wernz, 1214 Register Ave., Baltimore 12, Md.
- BINGHAMTON**, First Wednesday, H. D. Bertholf, 46 Matthews St., Binghamton, N.Y.
- BOSTON**, Second Thursday, W. B. Wells, 94 Walnut Hill Rd., Chestnut Hill 67, Mass.
- BUFFALO-NIAGARA**, Second Thursday, W. J. Ickel, R.F.D. 1, Springhill, N.Y.
- CALUMET AREA**—L. H. Thill, Centennial Foundry & Machine Co., East Chicago, Ill.
- CANTON**, Fourth Thursday, C. H. Smith, 602 9th St., N.W., Canton, Ohio.
- CEDAR RAPIDS**, Third Wednesday, R. L. Coyner, 119 Rapids Ave., S. W., Cedar Rapids, Iowa.
- CENTRAL PENNSYLVANIA**, First Wednesday, R. H. Meckley, R.F.D. 1, Red Lion, Pa.
- CHAUTAUQUA-WARREN**, Third Thursday, R. J. Wilson, Jr., Sylva-vania Prod. Co., Warren, Pa.
- CHICAGO**, First Monday, H. A. Paine, Federal Machine Sales, 4639 Washington Blvd., Chicago 44, Ill.
- CINCINNATI**, Second Tuesday, R. B. Niebusch, 3921 Woodford Rd., Cincinnati 13, Ohio.
- CLEVELAND**, Second Friday, G. W. Carlton, 1910 Seneca Dr., Euclid 17, Ohio.
- COLUMBUS**, Second Wednesday, E. A. Bartlow, 2080 Riverside Dr., Columbus 12, Ohio.
- DAYTON**, Second Monday, R. A. Miller, Economy Tool & Die, P.O. Box 127, Dayton 10, Ohio.
- DECATUR**, Next to last Thursday, Robert Serr, Forrest Knolls Est., Decatur, Ill.
- DENVER**, First Thursday, C. J. Helton, 61 S. Cherokee, Denver 9, Colo.
- DES MOINES**, Third Wednesday, G. F. McMaster, 304 Hillside, W., Des Moines, Iowa.
- DETROIT**, Second Thursday, Michael Pinto, Douglas Tool Co., 3437 Goldner Ave., Detroit 10, Mich.
- ELMIRA**, First Monday, E. C. Bates, 111 Oakwood Ave., Elmira Hts., N. Y.
- ERIE**, First Tuesday, H. M. Rudd, 2717 Cascade St., Erie, Pa.
- EVANSVILLE**, Second Monday, P. W. Vierling, Benerson Corp., 418-424 N. Willow Rd., Evansville 20, Ind.
- FAIRFIELD COUNTY**, First Wednesday, R. W. Smith, 141 Edgell Rd., Fairfield, Conn.
- FOND DU LAC**, Second Friday, E. J. Kaiser, 530 E. Division St., Fond du Lac, Wis.
- FORT WAYNE**, Second Wednesday, D. D. Welbaum, 2318 Wayne-Wood Dr., Ft. Wayne 6, Ind.
- FOX RIVER VALLEY**, First Tuesday, P. C. Shaner, 203 N. Wash-ington, Batavia, Ill.
- GOLDEN GATE**, Third Wednesday, D. A. Gustafson, 2765 Ar-gyle St., Oakland 2, Calif.
- GRAND RIVER VALLEY**, First Friday, John Ward, Can. Gen-eral Tower, 52 Middleton St., Galt, Ont., Can.
- GRANITE STATE**, Second Tues-day, J. J. Repetto, Clarostat Mfg. Co., Washington St., Dover, N.H.
- GREATER LANCASTER**, Second Tuesday, R. C. Moorhead, 1912 Sterling Pl., Lancaster, Pa.
- GREATER NEW YORK**, First Monday, H. W. Barclay, New York Times, 229 W. 43rd St., New York, N.Y.
- HAMILTON**, Second Friday, C. E. Bulmer, 43 Whitton Rd., Hamil-ton, Ont., Can.
- HARTFORD**, First Monday, O. A. Gingras, Pratt & Whitney Div., West Hartford, Conn.
- HOUSTON**, Second Tuesday, H. O. Traugher, 302 Norwood, Hous-ton 11, Tex.
- INDIANAPOLIS**, First Thursday, Joe Penn, 526 Mills Ave., In-dianapolis 27, Ind.
- JACKSON**, Third Monday, Theo-dore Vickers, 726 Griswold St., Jackson, Mich.
- KANSAS CITY**, First Wednesday, M. R. Grundy, 2600 Somerset Dr., Kansas City 5, Mo.
- KEYSTONE**, First Thursday, Jack Lipman, 439 Irving Ave., N., Scranton, Pa.
- KNOXVILLE-OAK RIDGE**, M. B. Hilton, Lester Rd., Rte. 10, Knoxville, Tenn.
- LACROSSE**, Fourth Tuesday, E. J. Giroux, 1035 S. 19th St., La Crosse, Wis.
- LANSING**, Fourth Monday, R. F. Gietzel, Rte. 2, Box 380, Lan-sing, Mich.
- LEHIGH VALLEY**, Third Friday, J. D. Folwell, 614 N. St. Elmo, Allentown, Pa.
- LIMA**, Third Thursday, A. E. Feightner, R.F.D. No. 1, Elda, Ohio.
- LITTLE RHODY**, First Thursday, F. W. Kunath, 29 Taylor St., Cranston, R. I.
- LONDON-ST. THOMAS DISTRICT**, Third Thursday, Louis Jensen, Kelco Eng., Ltd., 352 Thames St., London, Ont., Can.
- LONG BEACH**, Second Wednesday, C. E. Blanchard, 5760 Applan Way, Long Beach 3, Calif.
- LONG ISLAND**, Second Mon-day, Arthur Cervenka, Vander-bilt Blvd., Oakdale, L. I., N. Y.
- LOS ALAMOS**, First Wednesday after second Tuesday, R. H. Moller, 2146A 43rd St., Los Alamos, N. M.
- LOS ANGELES**, Second Thurs-day, C. L. Almquist, Almquist Bros., 2300 E. 49th St., Los Angeles 58, Calif.
- LOUIS JOLIET**, Third Tuesday, H. J. Moffat, Caterpillar Tractor Co., Joliet, Ill.
- LOUISVILLE**, Second Tuesday, R. F. Lenz, 3127 Eagle Pass, Louisville 13, Ky.
- MADISON**, Third Thursday, E. C. Helmke, Gisholt Mach. Co., 1200 E. Washington, Madison 10, Wis.
- MEMPHIS**, Second Friday, A. T. Hicks, Hays Machine Tool Co., 269 So. Front, Memphis, Tenn.
- MID-HUDSON**, Second Tuesday, S. P. Cook, Vassar View Rd., Poughkeepsie, N. Y.
- MILWAUKEE**, Second Thursday, E. J. Anspach, Line Material Co., 700 W. Michigan St., Mil-waukee 2, Wis.
- MOHAWK VALLEY**, Fourth Tuesday, E. K. Wheat, 301 Ot-sego St., Ilion, N. Y.
- MONTREAL**, Second Thursday, C. A. Gareau, 1080 Crevier Ville, St. Laurent, Que., Can.
- MUNCIE**, First Tuesday, N. E. Hines, 2106 1/2 So. Washington St., Marion, Ind.
- MUSKOGON**, Paul Hornak, 1917 Seminole Rd., Muskogon, Mich.
- NASHVILLE**, Third Tuesday, W. A. Thornberry, General Machine Co., 715 12th Ave., So., Nash-ville 4, Tenn.
- NEBRASKA**, Third Thursday, J. A. Duncanson, P. O. Box 148, Seward, Neb.
- NEW HAVEN**, Second Thursday, E. E. Lull, Crucible Steel Co., 131 Park St., New Haven, Conn.
- NEW ORLEANS**, Second Wednes-day, L. V. Graham, 4994 Mon-tegue, New Orleans 22, La.
- NIAGARA DISTRICT**, First Thursday, A. A. Clarkson, 154 S. Dr., St. Catharines, Ont., Can.
- NORTHERN MASSACHUSETTS**, Third Tuesday, G. H. Stimson, Greenfield Tap & Die Co., Sanderson St., Greenfield, Mass.
- NORTH TEXAS**, Second Friday, J. E. Franklin, 705 N. W. 9th St., Grand Prairie, Tex.
- NORTHERN NEW JERSEY**, Sec-ond Tuesday, W. E. Wheaton, 915 W. 6th St., Plainfield, N. J.
- PATERSON**, C. M. Bazaz, 272 Maryland Ave., Paterson, N. J.
- PEORIA**, First Tuesday, R. J. Zimmerman, Box 91, Roanoke, Ill.
- PETERBOROUGH**, First Thurs-day, Leendert Hansler, 624 Donegal St., Peterborough, Ont., Can.
- PHILADELPHIA**, Third Thurs-day, C. R. Pittsinger, 210 Mont-gomery Ave., Oreland, Pa.
- PHOENIX**, First Monday, C. W. Vermilyea, Motorola Research Lab., Phoenix, Ariz.
- PIEDMONT**, Second Monday, E. N. Dietler, Crucible Steel Co., P. O. Box 2402, Charlotte, N. C.
- PITTSBURGH**, First Friday, L. J. Brozek, 2508 Collins Rd., Pitts-burgh 35, Pa.
- PONTIAC**, Third Monday, H. V. Phipps, Cutting Tool Supplies, 88 S. Cass Ave., Pontiac, Mich.
- PORTLAND, ME.**, Second Friday, F. B. Taylor, 18 Birch Ln., R.F.D. 4, Portland, Me.
- PORTLAND, ORE.**, Third Thurs-day, M. S. Nielsen, 9043 N. W. Leahy Rd., Portland 1, Ore.
- POTOMAC**, First Thursday, G. M. Beck, 7917 Kentbury Dr., Beth-esda, Md.
- RACINE**, First Monday, W. E. Swan, Racine Tool & Machine Co., 1760 State St., Racine, Wis.
- RICHMOND**, Second Tuesday, R. H. Culbertson, 11 S.W. 5th, Richmond, Ind.
- ROCHESTER**, First Monday, D. F. Kohler, 240 Vanvoorhis Ave., Rochester 17, N. Y.
- ROCKFORD**, Second Thursday, William Moreland, 3304 Minne-sota Ave., Rockford, Ill.
- SAGINAW VALLEY**, Third Thurs-day, D. A. McMillan, 3316 Court St., Saginaw, Mich.
- ST. LOUIS**, First Thursday, W. J. Potthoff, Rte. 2, Box 64, Graesser Rd., Creve Coeur, Mo.
- SALT LAKE CITY**, Second Fri-day after first Wednesday, Fred-erick Preator, 530 N. Third, East Logan, Utah.
- SAN DIEGO**, Second Tuesday, A. E. Crom, 1759 Oliver Ave., San Diego 9, Calif.
- SAN FERNANDO VALLEY**, First Wednesday, Rudolph Regen, 4523 Fulton Ave., Sherman Oaks, Cal.
- SAN GABRIEL VALLEY**, First Thursday, Peter Carter, Rain Bird Sprinkler Mfg. Corp., 19233 E. Foothill, Glendora, Calif.
- SANTA CLARA VALLEY**, Third Tuesday, W. C. Lanyon, 104 Oak Hill Way, Los Gatos, Calif.
- SCHENECTADY**, Second Thurs-day, G. S. Nelson, 315 Florida Ave., Amsterdam, N. Y.
- SEATTLE**, Fourth Tuesday, R. A. Coady, 6559 43rd Ave., N. E., Seattle 5, Wash.
- SOUTH BEND**, Second Tuesday, J. L. Kemp, 909 Sherman, South Bend 16, Ind.
- SPRINGFIELD, ILL.**, First Tues-day, E. J. Kane, 200 S. MacAr-thur Blvd., Springfield, Ill.
- SPRINGFIELD, MASS.**, Second Monday, R. M. Dickson, 29 May-brook Rd., Springfield 9, Mass.
- SPRINGFIELD, OHIO**, Second Tuesday, R. C. Montanus, Signal Hill Rd., Springfield, Ohio.
- SYRACUSE**, Second Tuesday, R. D. Fulford, 309 Melrose Ave., Syracuse 6, N. Y.
- TOLEDO**, Second and Fourth Wednesday, J. J. Kertz, 4554 Willys Parkway, Toledo 12, Ohio.
- TORONTO**, First Wednesday, D. R. J. Few, 85 Northline Rd., Toronto, Ont., Can.
- TRI-CITIES**, Second Wednesday, G. H. Jording, 2015 42nd St., Rock Island, Ill.
- TUCSON**, Second Tuesday, J. D. Beach, 5828 Nogales Hwy., Tucson 2, Ariz.
- TULSA**, Second Thursday, L. W. Williams, 717 So. Marion, Tulsa, Okla.
- TWIN CITIES**, First Wednesday, C. E. Fasth, 2700 29th Ave., N. E., Minneapolis 18, Minn.
- TWIN STATES**, Second Wednes-day, George Julien, 26 Smith St., Springfield, Vt.
- WATERLOO AREA**, Third Wed-nesday, G. E. Osworth, Tecum-seh Products, Tecumseh, Mich.
- WESTERN MICHIGAN**, Second Monday, H. J. Swanson, Swan-son Machine, 1422 Lake Dr., S.E., Grand Rapids 6, Mich.
- WICHITA**, Second Wednesday, A. A. Reddy, 430 S. Vine, Wichita, Kan.
- WILLIAMSPORT**, Second Mon-day, W. J. McCoy, 316 E. Cen-tral Ave., S. Williamsport, Pa.
- WINDSOR**, Second Monday, J. F. Johnston, 30 Thomson Blvd., Riverside, Ont., Can.
- WORCESTER**, First Tuesday, J. E. Rotchford, Lodding, Inc., 73 Beacon, Worcester 2, Mass.

# Coming MEETINGS

**PHILADELPHIA**—April 26-30. American Society of Tool Engineers' Industrial Exposition and 22nd Annual Meeting.

**ATLANTA**—March 15. Annual Party.

**BUFFALO-NIAGARA FRONTIER**—March 13, Hotel Niagara, Niagara Falls, N. Y. Installation of officers and party.

**CALUMET AREA**—March 17. "Production Tooling Problems" by Harry Conn, chief engineer, Scully-Jones and Co., Chicago.

**CANTON**—March 25. "Tool and Production Grinding" by W. E. Foreman, Norton Co.

**CEDAR RAPIDS**—March 17. "Motion and Time Measurement" by J. F. Biggane, manager of Industrial Engineering, Maytag Co., Newton, Iowa.

**CHAUTAUQUA-WARREN**—March 18, 6:30 p.m., American Legion, Warren, Pa. The film "Manufacture of Hi Carb Hi Chrome Tool Steel" will be shown.

**CHICAGO**—March 1, 6:30 p.m., Keyman's Club. "New Developments in Grinding" by J. C. Wilson, vice president in charge of sales and engineering, Thompson Grinder Co., Springfield; James Meehan, director of grinder and milling machine sales, Brown and Sharpe Co., Providence, R. I.; and Harry L. Strauss, National Diamond Laboratory, New York City. On March 11—tour of International Harvester, West Pullman Works.

**CINCINNATI**—March 9, 8:00 p.m., Headquarters, Engineering Society of Cincinnati. "Drills, Their Use and Abuse" by Phillip C. Satterthwaite, factory manager and vice president Cogsdill Twist Drill Co., Detroit.

**CLEVELAND**—March 19. Ladies' Night and installation of officers.

**DETROIT**—March 11, Rackham Memorial Building. A dissertation on Psychology by Dr. Murray Banks, former professor of psychology and head of the psychology department, Long Island University.

**ERIE**—March 2, 6:30 p.m., G. E. Community Center. "A Discussion of Punching and Notching Equipment" by John C. Kosky, a representative of Wales Strippit Corp.

**FAIRFIELD COUNTY**—March 3. "Tool Steel—the Key to Efficient Produc-

tion" by A. J. Schiel, chief metallurgist, Columbia Tool Steel Co., Chicago Heights, Ill. Also installation of officers.

**FORT WAYNE**—March 10, 6:45 p.m., Chamber of Commerce. "Special Automatic Machines" by E. Flook and R. Brangan of National Automatic Tool Co., Richmond, Ind.

**FOX RIVER VALLEY**—March 2, 7:00 p.m., Baker Hotel, St. Charles, Ill. Installation of officers by Edward Dickett, member of the National Editorial Committee and of Sundstrand Machine Tool Co., Rockford.

**GRAND RIVER VALLEY**—March 5. "Jig Boring" by representatives of George Gorton Machine Co.

**GREATER LANCASTER**—March 9, 6:45 p.m., Rainbow Room of American Legion, Ephrata, Pa. "The Use of Radioactive Tracers in Petroleum Research" by Hugh R. Jackson, Automotive Laboratory, Atlantic Refining Co., Inc., West Reading, Pa.

**HOUSTON**—March 9, 6:30 p.m., Ben Milam Hotel, Roger F. Waindle, national ASTE president and Howard Tellepsen, president of Tellepsen Construction Co., Houston, and president of the 1954 Houston Chamber of Commerce, will speak.

**INDIANAPOLIS**—March 4. Installation of officers and Past Chairmen's Night. "High Velocity Turning" by J. C. Herbert, general sales manager, Jones and Lamson Machine Co., Springfield, Vt.

**LACROSSE**—March 23. "Pivot Punches & Dies—Their Uses and Applications" by J. R. Reinertson, Pivot Punch & Die Corp., Chicago.

**LIMA**—March 19, 6:30 p.m., Royal Pine Room. Talk by A. O. Schmidt, research engineer, Kearney & Trecker Corp., Milwaukee.

**LITTLE RHODY**—March 4, 7:00 p.m., Johnson's Grille. "New England" by Melvin D. Peach, manager industrial department, New England Council.

**LONG ISLAND**—March 8, 8:30 p.m., Garden City Hotel. "Induction Heating" by Dr. Harry B. Osborn, Jr., technical director of Tocco Division, The Ohio Crankshaft Co., Cleveland, and second vice president of ASTE.

**MILWAUKEE**—March 11, 6:30 p.m., Serb Memorial Hall. "Johnson's Wax in Industry" by George L. Boehm, chief sales engineer, S. C. Johnson & Son, Racine, Wis.

**MID-HUDSON**—March 20, 6:30 p.m., Germania Hall. Roger F. Waindle, national president of ASTE, is special guest and speaker. Ladies' Night.

**NIAGARA DISTRICT**—March 4, 7:00 p.m., Queensway Hotel, St. Catharines, Ont. "Hard Chrome Plating to Size" by B. A. Taylor, vice president, Chrome Electro-Forming Co., Detroit.

**NORTH TEXAS**—March 12, 7:30 p.m., Amon Carter International Airport. "Oil Well Cementing" by a representative of Halliburton Oil Well Cementing Co., Duncan, Okla.

**NORTHERN MASSACHUSETTS**—March 16, "Tooling for Induction Heating" by Dr. Harry B. Osborn, Jr. second vice president and national director of ASTE, and technical director of Tocco Division, Ohio Crankshaft Co., Cleveland.

**PITTSBURGH**—March 5, 6:30 p.m., Sheraton Hotel. "Tool & Die Maintenance Welding" by L. D. Richardson of Eutectic Welding Alloys Corp.

**ROCKFORD**—March 11, Executive Night and installation of officers. Dr. Harry B. Osborn, Jr., and W. W. Gilmore, president, Micro-Switch Co., Freeport, Ill., guest speakers.

**SAN DIEGO**—March 13, 7:00 p.m., El Morocco Cafe. Installation of officers, dancing, floor shows at the St. Patrick's Dance.

**SEATTLE**—March 23, Installation of officers by Dr. Harry B. Osborn, Jr., second vice president and national director of ASTE, technical director of Tocco Division, Ohio Crankshaft Co., Cleveland.

**SPRINGFIELD, MASS.**—March 8, 7:30 p.m., Springfield Turn-Verein. "Chains and Sprockets" by a representative of Baldwin Duckworth, Div., Chain Belt Co., Springfield, Mass.

**TORONTO**—March 3, 6:30 p.m. "Evolution of Industrial Metrology" by J. D. Riley, sales manager American S.I.P. Corp.

**TUCSON**—March 9, 8:00 p.m. Election of officers, and "Titanium—Its Machinability and Uses" by John Milek, research engineer, Hughes Aircraft Co., Culver City, Calif.

**TWIN STATES**—March 10. Trade Winds Cafe. Installation of officers and social hour.

## Plan Second Annual Tool Engineers' Day

The New York chapters have planned a second annual Tool Engineers' Day to be held on April 6 at the Hotel Commodore, New York City. Participating chapters are Long Island, Newark, Greater New York, Paterson and New Hudson chapters.

Long Island chapter is acting host, with chairman Arthur Cervenka as chairman of the event, George McLoughlin as secretary, and George Bennett as chairman of the arrangements.

Starting at noon several plant tours have been arranged. Among them are Ford Motor Co. in Edgewater; the American Can Co. in Brooklyn; the Eutectic Welding Alloys Corp. in Flushing; the Navy Yard in Brooklyn where the new carrier, U.S.S. Saratoga can be seen; and the New York Times and its facsimile plants.

At 5 p.m. a panel discussion on the subject "Industrial Resources in the Metropolitan Area" will be held, followed by a social hour.

## Company Elects New Vice President

Frederick E. Munschauer, Jr., a member of Buffalo-Niagara chapter, has been elected to the new office of vice president in charge of manufacturing and industrial relations of the Niagara Machine & Tool Works, Buffalo. The announcement was made by George E. Munschauer, vice president-treasurer of the company. The new vice president will continue as works manager also.



Representatives of Philadelphia chapter affiliate members received plaques at the January 19 meeting. Front row, left to right, are: Gustav Peterson of Edgecomb Steel Co.; Dwight Renfrew of Link-Belt Co.; Chairman Campbell Pittsinger who made the awards; Frank Moorehead of Lloyd & Arms Inc.; and Professor William Stevens of Drexel Institute. In the back row are: James Quaid of Quaid Fabrications, Inc.; Admiral Logan Ramsey of Spring-Garden Institute; Arthur Donovan of Hill-Chase Co.; Clarence Duffany of Hall Planetary Co.; Albert Small of Atlantic Mfg. Co.; Chester Pietrowski of Almco Co.; and Donald Taylor of the Horace T. Potts Co.

## Philadelphia Presents Affiliate Plaques

Philadelphia—At coffee time during the January 19 meeting of Philadelphia chapter held at the Engineers Club, Campbell R. Pittsinger, chairman of the chapter, presented recognition plaques to affiliate member representatives.

Donald Schoeller, head of the Time and Motion Laboratory of Pennsylvania University's Wharton School, was the evening speaker. Mr. Schoeller developed the relationship between tool engineering and industrial engineering. With the assistance of a sound film, he showed the importance of machine and tool design to high productivity and the elimination of operator fatigue.

—Karl K. Rauch

## Isotopes Discussed by Dr. Brunton

Galt, Ont.—Grand River Valley chapter met at Shep's Hall on January 8 to hear Dr. Donald C. Brunton, atomic scientist and president of Isotopes Ltd. Dr. Brunton discussed "The Uses of Isotopes in Industry," talking on applications such as measuring the thickness of moving materials as in strip in strip-mills, paper and rubber.

Dr. Brunton also stated that isotopes from Chalk River, Ont. are the most powerful on this continent, as well as being more effective than X-ray for radiography as applied to pipeline welds in large storage tanks.

On December 4, 95 members turned out for the regular monthly meeting. O. McIntyre, manager of sales engineering, Norton Co., outlined crushed grinding techniques for intricate contour grinding.

—W. C. Little



Seated at the head table during the Worcester meeting are: from left, Andrew Peterson, treasurer; Adam Kosciuszko, second vice chairman; Dr. Harry B. Osborn, Jr., technical director of Tocco Division, Ohio Crankshaft Co., and speaker for the evening; John Rotchford, chairman; Lester Mulno, chief engineer, Harrington & Richardson Arms Co.; J. Irving England, secretary; Kenneth Stumpf, northeast representative of Tocco Division; and Donald Eaton, chairman of the entertainment committee of Worcester chapter.

## Worcester Hears ASTE Vice President

Worcester—Dr. Harry B. Osborn, Jr., technical director of the Tocco Division of Ohio Crankshaft Co. and second vice president of ASTE, was the guest speaker at Worcester chapter's January meeting. He spoke to 65 members and guests on the subject "Induction Heating."

Dr. Osborn's Address was preceded by tours of two plants of Harrington & Richardson Arms Co., where members observed the manufacture of the Garand rifle.

After the plant visits, the chapter adjourned to Putnam & Thurston's Restaurant for dinner.

—A. H. Shairman

# News in Metalworking . . .

## INNOVATION IN STEEL MAKING

First tunnel-type furnace to be used exclusively for steel making has been completed at the Timken Co.'s mill in Canton, Ohio. Heating capacity of the estimated \$500,000 furnace will be fifty tons per hour. Actually the start was made toward the use of tunnel-type furnaces for heat treating steel during World War II. However, that was only as an emergency measure, and a ceramic concern was contracted to perform the work.

The new furnace will offer several advantages through economy to its users. Primarily, it is expected to cut by 20 percent the 2,900,000 btu per ton of steel heated required by the roll down furnaces which it replaces. In addition to the marked reduction in fuel consumption, there will be a considerably diminished scale loss.

Still further savings will be represented by manhour comparisons. Now two men will operate the new furnace as opposed to a previously required seven.

In the new unit, temperature, air fuel ratio and furnace pressure are all controlled automatically. Rounds are charged into the furnace with a tong-type automatic charging machine, one or two at a time, depending on whether single or double rows of billets are wanted.

Billets are carried through the fur-

nace on cars 12 feet wide and 11 feet 9 inches long, at speeds which can be adjusted from six to thirty-two inches per minute. Eleven moving cars form the hearth of the furnace. They move through three heating zones which can be adjusted in temperature for the heating cycle desired. The final heating zone is capable of heating billets to a maximum of 2300 F. Equipped with 34 burners, the furnace can use either gas or oil. Oil is used as the standby fuel.

A manually-controlled machine, similar to the automatic charging machine, discharges the cars which are then pulled onto an exit lift by a hydraulically operated car separator, lowered to a level beneath the furnace and returned by means of a dolly to the charging end of the furnace in 40 seconds. Again, the car is moved onto a hydraulic lift, raised to the furnace level at the charging end, and the cycle is completed.

The hydraulic lifts and the car separator are operated by a 200 psi hydraulic system supplied by a 40 hp pump. Movement of cars through the furnace is achieved by means of a hydraulic under car puller cylinder which is operated by an 800 psi hydraulic system powered by a 15 hp pump.

The charging and discharging machines each have a 650 psi hydraulic

system powered by 15 hp motors.

The distance between the charging door and the discharging door is 108 feet. Width of the hearth is 12 feet. Over-all length of the furnace, including the lifts and vestibules at either end of the furnace, is 148 feet.

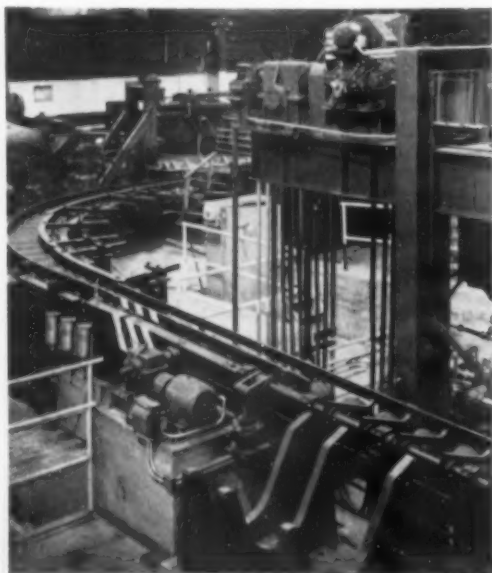
Last year, the Timken Roller Bearing Co. installed the first magnetic stirrer in this country on one of its electric furnaces. Now introduction of this tunnel-type furnace in steel making, another Timken Co. first, will further reduce operating costs and increase production capacity.

## MECHANIZING WELDING METHOD PICKS UP PRODUCTION

Advantageous results, both cost and time-wise, as well as in quality, have been brought about by ingenious changes in fastening methods at Bingham Stamping Div. of Bingham-Herbrand Corp. of Toledo. There, production is concerned with compressor housings used in domestic air-conditioning units.

After 600-ton presses stamp out the two required parts, two Nelson shoulder-type threaded studs, used to support the compressor unit, are welded to a ledge or shelf on the inside of the larger stamping.

The former method, by which specially machined studs were hand arc welded to the ledge, presented severe warpage, locating and cleaning problems, and consequently resulted in an excessive number of rejects. In ad-



At left, photograph shows the outlet conveyor from the tunnel furnace.

Below. Inlet to the furnace is shown here together with charging equipment.





Above left. Pencil points to shoulder-type threaded stud used to hold and support the compressor unit. It is end-welded to a ledge on the inside of the larger stamping.

Center. Work now may be done on a production-line basis.

Far right. Finished batch of stud welded compressor housings.



dition, this time required for welding cancelled the possibility of using mass production techniques.

Fastening engineers from the Nelson Stud Welding Div. of Gregory Industries, Inc., offered a solution with specially designed granular flux-filled studs for the application, and the installation of two twin-gun Nelweld production units on a revised high-speed production line.

With the semi-automatic Nelson stud welding equipment, direct fastening costs were immediately reduced by 30 percent. Housings are now stud welded at an average rate of  $3\frac{1}{2}$  per minute (192 units per hour), compared with the more than two minutes formerly required for each housing when hand arc welding was employed. Warpage and stud locating and alignment problems have been eliminated, and the end product is much cleaner.

Sequence of Bingham's two production lines follow this pattern: After three thermal bushings are projection welded onto the housing, it moves to the operator of the stud welding unit who places the housing in a locating fixture below the guns. He then loads a stud and ceramic ferrule into the chuck of each gun and presses a button which automatically clamps the piece, moves the guns down to the housing and welds the studs. Welding of the stud takes only a split-second. Guns then automatically return to normal position.

The next man taps the outside of the housing with a hammer which removes the ferrules. An inspector next examines the piece and passes it onto a worker who wipes out the inside of the housing. Finally the housing is dipped into a rust-preventative solution, ready for shipment.

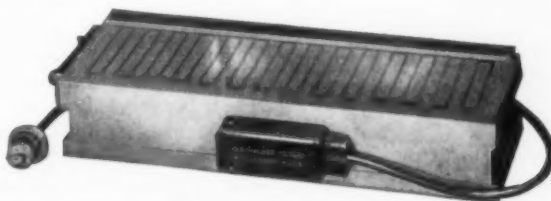
## Walker Chucks

*People dismiss as incredible the things they do not understand.*

Incredible indeed was the discovery of the force of magnetism when, according to legend, a Phrygian shepherd picked up bits of dark colored stone on the iron end of his crook.

Incredible also seemed the experience of man when he discovered the polarity of magnets. And—when Oakley S. Walker, founder of O. S. Walker Company, Inc., displayed the first magnetic chuck to his friends, they were incredible. But—not Mr. Walker, because he had experienced the fulfillment of logical thinking processes.

Today, Walker Magnetic Chucks are performing important functions in industry everywhere; and Walker engineers, as they have in the past, stand ready to solve any holding problem.



No. 618 Rectangular Magnetic Chuck

*Hold Everything with Walker Chucks*

**O. S. WALKER CO. Inc.**

WORCESTER 6, MASSACHUSETTS

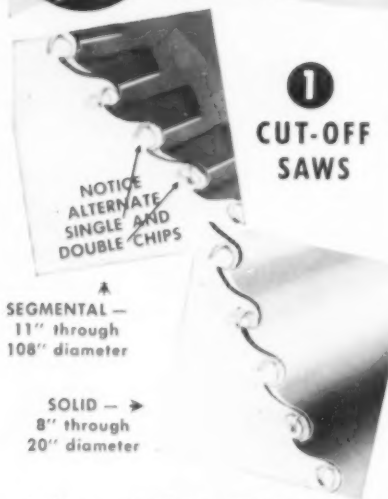
*Original Designers and Builders of Magnetic Chucks*

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11" through  
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Reduce scrap! Raise production! M. & M. has a segmental or solid Triple-Chip blade for every material, shape and size. You profit from highest practical speeds. Ends are square and burrless, and pieces meet close tolerances. Re-sharpen at low cost.



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ANY THICKNESS**

Triple-Chip Saw Blades produce curling, self-clearing chips. Stresses are relieved, breakage minimized. The Dual Drive feature makes keyways unnecessary. Adaptor keyed to arbor permits blade interchangeability.

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BLADE GRINDER

INDICATE A-3-114-1

### 1 CUT-OFF SAWS

### 2 SLITTING & SLOTING SAWS

or services. (2) It should be clearly better than comparable products or processes rather than simply an alternative. (3) Research development on the item should be completed so that it is ready or almost ready to be put into production. (4) Preferably, it should be an item that can be sold readily through existing sales or merchandise channels. (5) And finally, the potential market should be large enough in size and the difference between cost and sales price should be great enough so that substantial profits may be expected to compensate for the time, money and effort spent in order to put the invention on the market and defend it against competition.

Material offered for review may be submitted in writing to the Invention Conference Group of the Cleveland Engineering Society, 2136 E. 19th St., Cleveland 15, Ohio, on or before April 1. The group has cautioned inventors against sending original patent papers since all material submitted will not be returned. Such matter becomes the property of the Society, and as such will be deposited in its library.

Joseph H. Gepfert of Reeves Pulley Co. is general chairman while Walter T. Gollwitzer, Addressograph-Multi-graph Corp., is meeting chairman, and Emmett C. Hartley, Parker Appliance Co., functions as exhibit chairman.

Discussions for the afternoon and evening will cover such phases of the subject as "Technique of Invention," "Fitting an Idea into Production," "Fitting an Idea into Marketing," "The Future of Invention in Industry," and "The Manufacturer Looks to Invention."

The exhibition is to be at the Cleveland Engineering Society building.

### MOVING SHOWROOM EXHIBITS SCREW MACHINE WORK

Users of screw machinery are now having a turn at examining equipment at their own doorsteps. Demonstrations are being carried to the field by means of the mobile unit currently traveling out from Guthery Machine Tool Corp. On the truck, Leinen turret lathes, the Traub single spindle automatic screw machine and the Swiss-type Traub are exhibited under power manufacturing typical screw machine parts.

The traveling unit's itinerary, which began with a southern swing, continued to the West, and will proceed with a general course through the midwest and central states.

Arrangements may be made in advance for a visit by this mobile screw machine show by contacting Peter Flesch of Dayton & Bakewell, 1939 Santa Fe Ave., Los Angeles, Calif.

# Cuts Machining Time



## SOUTH BEND

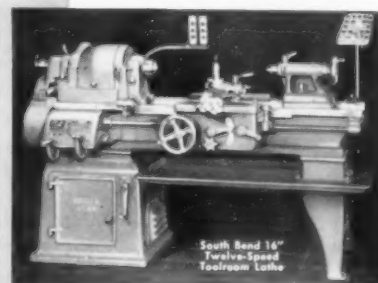
### 12-SPEED LATHE

The wide range of spindle speeds on this new lathe cuts machining time because the operator quickly selects the right speed for each operation. Pushbutton control provides a fast change from any high speed to the corresponding low speed. Its 48 longitudinal and cross feeds assure maximum efficiency on every job.

**\$2690.00**

F.O.B. Factory

CL-8155C—as illustrated below, less motor and controls. Time terms: 10% down, balance in 12 or 18 months.



### SPECIFICATIONS

**Spindle Speeds** (approx.) Direct: high range 300, 550, 945; low range 150, 278, 475. Back gear drive: high range 32, 70, 118; low range 20, 33, 60.

**Spindle Bore** — 1 3/8".

**Swing over bed** — 16 1/4".

**Swing over saddle cross slide** — 9 1/2".

**Distance between centers** — 33 1/4", 45 1/4", 57 1/4", 81 1/4", 105 1/4".

**Collet Capacity** — 1" maximum.

**Thread Pitches** — 48, 4 to 224 per inch.

### SOUTH BEND LATHE

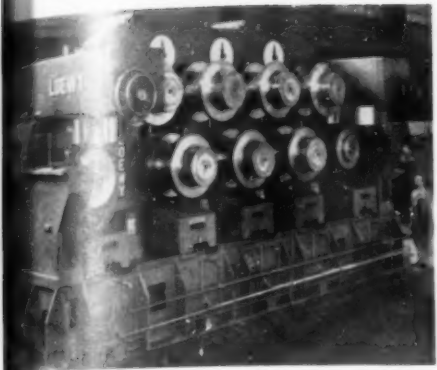
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Building Better Tools Since 1906

# SOUTH BEND LATHES

INDICATE A-3-114-2

The Tool Engineer



### STRAIGHTENER FOR I-BEAMS

Seven overhung type rollers, the upper four driven by two motors, are incorporated in this heavy-duty roller straightener built by the Loewy Rolling Mill Div. of Hydropress, Inc., for straightening rails and heavy I-beams. All gearing is incorporated within the machine frame, eliminating a separate drive or coupling. Roller bearings are used throughout.

By providing extremely accurate adjustments, quality straightening results in one pass are obtained. Change-over time is reduced to a minimum by the preassembled overhung rollers.

### INVENTORS TO SHOW WORK

Meeting ground for inventors and industrial users—the sellers and buyers of ideas—will be provided by the Invention Exhibit and Conference planned by Cleveland Engineering Society for May 3. The 74-year old engineering organization is sponsoring the event not only to offer inventors an opportunity to make a bid for profitable recognition, but to offer a mutual service and also further stimulate invention.

Exhibits of operating and non-operating units or models, which are available for leasing, licensing or sale, will be on display, while coincidental afternoon and evening programs of informational talks on invention will be presented.

The engineering society's Invention Conference Group is looking for inventors who have a practical product or process to submit patent papers, or resume, and a commercial description if available. These should be submitted to the group not later than April 1. Non-patented items are acceptable only if submitted with a disclosure form obtainable from the society.

Five measures will be used in judging the "practical product or process" aspect of each entry. (1) It should definitely fill a specific human need, whether it is to be used directly by the consumer or in production of products

March, 1954

# What's in this NAME? KENDEX\*

It's the Trade-Name  
for Multiple-edge,  
Indexable, Tungsten  
Carbide Insert  
Tools Produced by  
Kennametal Inc.



### EXCLUSIVE FEATURES

1. *Made of Kennametal*—Kendex inserts have its uniform high hardness and exceptionally long life.
2. *Multiple, precision-ground cutting edges*—enabling a clean, sharp edge to be kept against the work continuously.
3. *Screw-mounted*—can be accurately indexed to a new cutting position, in seconds, without removing tool shank from holder.

### OPERATING ADVANTAGES

1. *Minimize downtime for tool changing*—major cause of high-cost operation.
2. *Eliminate tool grinding*—no regrinding; Kendex inserts are thrown away when all cutting edges have been used.
3. *"Balanced" tool budget*—it's penny-wise and pound foolish to "save" money by excessive reconditioning of old tools, when you can keep new cutting edges on the job continuously with Kendex inserts.

Ask your nearest Kennametal representative for details. Kennametal Inc., Latrobe, Pa.

\*Registered Trade-Marks

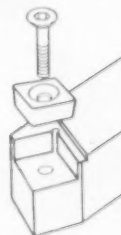
### How KENDEX\* Works



Hard, strong, wear-resistant Kennametal is molded into square, round, or triangular Kendex inserts, which are precision ground.

2

Kendex inserts are mounted to suitable tool holders with socket head screws.



3

When edge becomes dull, insert is turned to new cutting position. When all cutting edges have been used, insert is thrown away; no regrinding.



# KENNAMETAL

CEMENTED CARBIDE TOOLING  
THAT INCREASES PRODUCTIVITY

SALES OFFICES IN PRINCIPAL CITIES



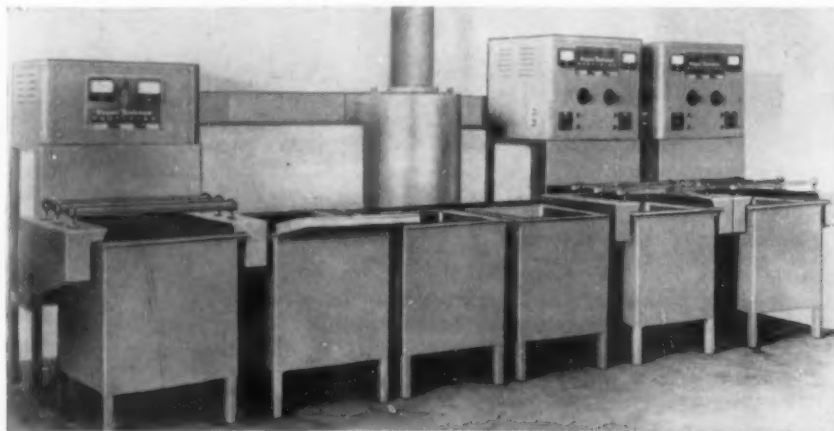
# Tools of Today . . .

## Precision Hard Chrome-Plating Unit

Development of a package precision hard chrome unit by Wagner Brothers, Inc., 463 Midland Ave., Detroit 3, Mich., now enables complete plating facilities for the Morey process for precision hard (industrial) chrome-plating to be set up for on-the-spot chrome finishing of production tools and parts. By engineering into the unit an exact science of control and procedure, the inexperienced operator

may do the precise plating jobs formerly left only to the experts.

Equipment furnished for the operation includes: six tanks, lead and neoprene tank linings, five rectifiers, a fume separation system, heat and timing controls and electrical connections ready for immediate installations. An intensive course of instruction in the advanced phases of precision plating is offered as a part of the process.



Based on the Morey Process, this equipment is said to accomplish extremely precise deposition of chrome plate.

According to the company, this industrial chroming unit "will plate with exact duplication of original finish, in deep threads or to the keenest cutting edge. It produces a surface harder than any existing plating method to prolong tool life up to 1000 percent."

Several exclusive features are incorporated in this equipment: An automatic electric heat control and timing system assures precision of plate deposition and makes grinding and lapping to size unnecessary. Individually controlled Wagner rectifiers permit two separate jobs to be plated at once, in the same tank. For safety, a built-in air-purifying unit removes harmful chemical fumes from the plant atmosphere and brings in clean air. A special, long-life solution with an exclusive catalyst, is used in the process.

Folder F 30-54 with further details is available from the manufacturer.

**T-3-1161**

USE READER SERVICE CARD ON PAGE 133 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

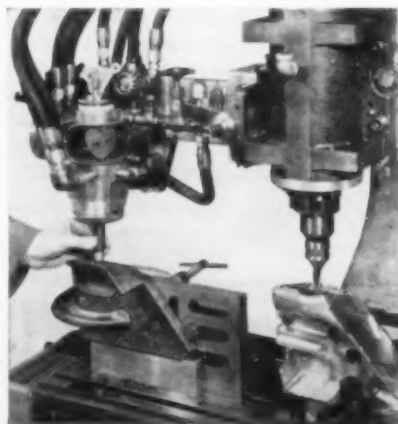
## Hydraulic Tracer

An unusual machine tool, developed particularly to meet the all-purpose needs of the aircraft industry, is this 3-dimensional True-Trace Model A-3D hydraulic tracer. Up to this time, True-Trace valves, operating on vertical and horizontal mills, planers, spar mills, boring mills, lathes, and hand duplicators, have been able to obtain precision duplication of any configuration within 180 and 360 degrees. The Model A-3D, traces 360 degrees in all directions. (Any combination of traverse, transverse and vertical motion simultaneously controlled via one tracer spindle.)

True-Trace Model A-3D hydraulic tracer converts a miller or other accurate metal-cutting machine tool that may be as much as 30 to 50 years of age into a high-precision, high-production, three-dimensional duplicator, in-

suring tolerances to as close as 0.005 to 0.0005 inch.

The tracer can be made to follow a low-cost, one-to-one ratio three-dimensional wood, plaster or metal templet with the same ease as would be re-



quired to trace it with a pencil.

Cutting control techniques allow for positive and constant feed rates, independent of varying operator pressure on spindle. Simple rate controls enable the operator to make feed rate changes quickly, thereby permitting optimum cutting feeds at all times.

As a big advantage, the tool offers versatility in that it may be used in any industry as a converter for creating an all-purpose, fast-production duplicating tool. Installation on a plant's new or older machinery can be accomplished readily in most cases. The model A-3D tracer costs \$2750.00. Additional necessary conversion material includes hydraulic power unit, hydraulic cylinders, mounting brackets and hydraulic lines and fittings.

For additional information write for Bulletin A-68, True-Trace Sales Corp., 2303 Chico Ave., El Monte, Calif.

**T-3-1162**

## Hand Tools for Milling and Grinding

Grinding, milling and polishing operations at speeds to 85,000, 70,000 and 55,000 rpm are performed with the air turbine hand tool recently introduced by Newage International, Inc., 235 E. 42nd St., New York 17, N. Y.

Its light weight, power and compact well-balanced design make handling easy, work accurate. Its air-driven turbine provides an unusually wide range of spindle speeds.

They may be used on an extensive variety of metals including heat-treated steels and tungsten carbide.

As a further advantage they can be used profitably to cut down nonoperating time because it is not necessary to remove the cutting tools from their



holders, especially on tools used in center, capstan and turret lathes.

Internal and external as well as thread grinding can be performed by the heavy-duty hand tool, which is primarily intended to be mounted, at any angle, on the cross slide of a lathe to perform those operations.

Among the most important construction features of these tools is that the spindle speeds can be varied quickly and endlessly over their complete range. Speeds are selected by a simple movement of a twist grip knob incorporated in the body.

The tools are designed for operation on air pressure from 60 to 100 lb per sq inch. Special orders will be accepted for operation on pressure down to 30 lb per sq inch. **T-3-1171**

## Automatic Wet-Blaster

Addition of a versatile automatic model to its line of standard, manually operated wet blasting units has been announced by the Cro-Plate Co., Inc., 747 Windsor St., Hartford, Conn.

Known as the Pressure Blast Roto-Matic, this model was designed for the elimination of hand filing, grinding, wire brushing and chemical cleaning of small metal parts and various plastic

and ceramic components.

Under working conditions, the operator is seated at the front of the unit and merely loads and unloads workpieces from the rotating table which incorporates appropriate work-holding fixtures. The cabinet interior is divided into three chambers accessible from all sides by means of inspection doors. These include the blast chamber where fixed position guns finish the work in part or entirely; the rinse chamber where abrasive slurry is rinsed from the work; and the air-dry chamber where the workpieces are dried.

A simple, readily accessible panel



# ELGIN PRECISION

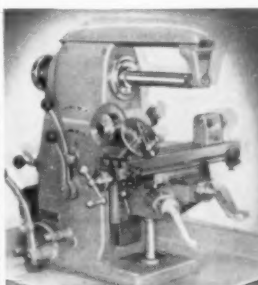
*for more than 50 years*

## LATHES MILLING MACHINES HAND SCREW MACHINES

### THE ELGIN TOOL WORKS

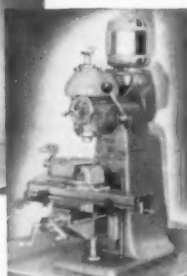
Precision characterizes the work of the expert mechanic . . . the man skilled in the use of tools and in the accuracy of his calculations. So it is, that a well constructed watch appeals to the good mechanic.

Back of the watch is the fine and accurate machinery, designed for the manufacture of its delicate parts, and if there is a wonder in watch-making, it begins there.



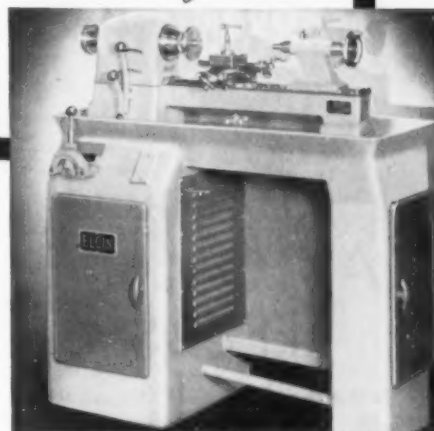
#### HM-5C HORIZONTAL MILLING MACHINE

- 85-2750 R. P. M. Continuously Variable
- Table: 4 1/2 x 18"
- Travel: Longitudinal 12" Transverse 6" Vertical 9"
- 1" Collet Capacity



#### VM-2 VERTICAL MILLING MACHINE

- 200, 700, 1250, 2250, 4000 R. P. M.
- Vertical Spindle Travel 13 1/4"
- 9/16" Collet Capacity



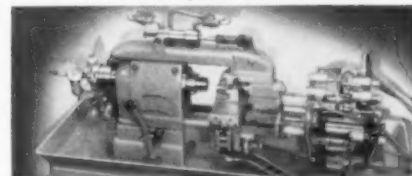
#### EP L-5C PRECISION TOOL ROOM LATHE

- 1" Collet Capacity.
- 9" Swing; 17" between centers.
- 120-3780 R. P. M., Continuously Variable.
- 3/4, 3/8 H. P.



#### ET-5C HAND SCREW MACHINE

- 1" Collet Capacity.
- 9" Swing; 17" between centers.
- Equipped with Turret, Cross Slide, Coolant Pump and Sump, Automatic Collet Closer and Variable Speed Drive.



#### AUTOMATIC LATHE

- For High Production turning and facing operations.
- Hydraulic Power Feeds.

## ELGIN TOOL WORKS, Inc.

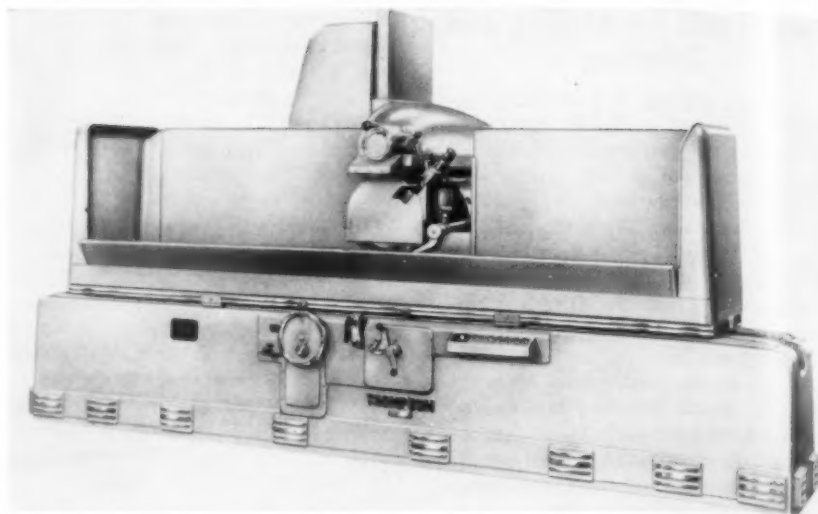
1773 Berteau Avenue, Chicago 13, Illinois

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-117

contains all necessary controls for operation. Included is a variable speed table drive regulator which governs the exact amount of time the work is to be blasted.

Because of its unusual flexible design, the Pressure Blast Roto-Matic may be used for any number of finishing operations where speed and uniformity are essential. The only requirement in switching from one type of work to another is a change in work-holding fixtures and a repositioning of the blast guns. More guns may be added at any time.

Two blast circuits are available, either regular velocity, which works on the aspiration or suction principle, or high velocity, which operates on the pressure tank system. **T-3-1181**



### Surface Grinder

A complete line of production surface grinders known as the Type C, ranging in size from 12 x 48 inches to 24 x 168 inches has been placed on the market by The Thompson Grinder Co. of Springfield, Ohio. Design of the units was aimed to accomplish greater speed, higher accuracy and more economical grinding of parts from a tool steel broach bar to a machine tool way.

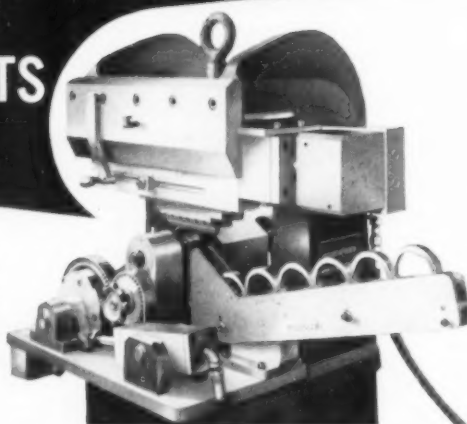
Principal features of the grinder include the 20-inch diameter wheel cross-feeding with the horizontal spindle and grinding with periphery of the wheel; and a patented antifriction elevating nut which avoids "wind-up" between nut and screw. The unit is equipped with power elevation and hydraulic rapid traverse with safety stops, and in-position wheel truing. Complete hydraulic table speed and cross feed levers are grouped at operating area and simplified with table speeds variable from 10 to 100 fpm and with cross feed control in increments of 1/32 inch to one half of wheel width per table reverse. Fast sparkout plus small increments of down feed and wide increments of cross feed at 100 fpm table speed provide high accuracy and quality of finish. Several other interesting features offered are these: the motor is built into wheel head and mounted directly on spindle; low pressure hydraulic system provides sockless power; lubrication is automatic; and the coolant system is separate. Bellows-type covers protect slide ways while bed ways are protected by tape, and columns are enclosed.


Similarly, important features are available in auxiliary equipment. Among these are automatic down feed; micrometer backup stop; dust exhauster; rectifiers and neutrolators for variable holding power to chuck wheel balancing ways and arbors; electric double angle wheel truing. **T-3-1182**


## YOU CAN CUT MARKING COSTS WITH...



### GEO. T. SCHMIDT AUTOMATIC FEEDS



In many applications, thousands of components per hour are marked, with  automatic marking equipment. Feeding mechanisms are designed for a specific operation, custom tailored to suit your requirements.

Perhaps  specialists can design automatic equipment to solve your marking problems.

A trained marking engineer is at your disposal to help you modernize your marking operations and cut costs to a minimum.



**MODEL 175 HYDRAULIC**



The unit illustrated above marks the periphery of bearing races at the rate of 2400 to 3000 per hour. It is fed directly from automatic screw machines, and requires no operator.

**IF IT'S WORTH MAKING, IT'S WORTH MARKING.**

**GEO. T. SCHMIDT, INC.**  
4104 Ravenswood Avenue  
Chicago 13, Illinois

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-118

## Carbide Drill

Following two years' research, Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich. announces a carbide-tipped twist drill incorporating five unusual construction features.

The spiral on the face of the carbide tip is accurately blended into that of the drill for better chip clearance and less strain; in addition, the end of the drill is radially relieved to provide more steel behind the tip and maximum support.

Further features include an extra heavy carbide tip for the drill, which also has an extra heavy web for strength and a heavy land to preserve its diameter and serve as a pilot. The entire body of the drill is high-speed steel, which assures a high Rockwell hardness with greater rigidity and longer life. Flutes of this drill are polished, making for cleaner operation.

A specially developed notch ground in the tip also contributes to faster feeds and more cuts per sharpening.

Tests indicate that feeds as high as 8 inches per minutes in cast iron have been obtained.

This drill has been established by the company as a standard and is stocked in fractional, wire and letter sizes.

**T-3-1191**

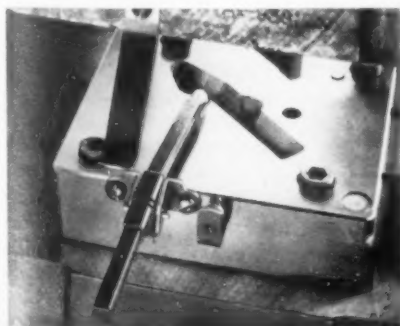
USE READER SERVICE CARD ON PAGE 133 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Automatic Die Stop

An unusual automatic and primary die stop is being offered by Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, Ill.

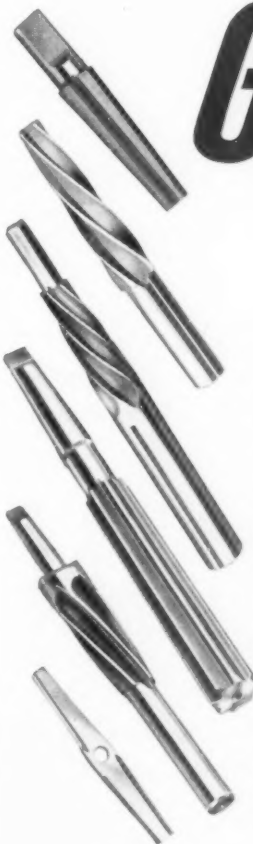
Improvements incorporated in the tool make it quickly fitted and economical enough to pay for itself even on short runs.

The automatic and primary stops and the trip spring are designed and engineered for adaptability to any die. Each part is durably constructed and the stops may be hardened if desired.



**FOR SPECIAL REAMERS . . . REMEMBER**

# GORHAM



They may not *look* alike, but all of the special tools on this page share a common function . . . *because every one is a reamer!* Each was engineered and manufactured by Gorham Tool Company to provide a practical solution to a specific production machining problem for one of our customers.

Actually, these reamers represent just a few of the many special-purpose cutting tools produced by Gorham. Others include milling cutters and end mills, inserted blade cutters, flat and circular form tools, profile cutters, and carbide tipped tools of every description. Gorham "specials" are turning problems into profits in thousands of plants every day . . . and the one we engineer for you will solve *your* next production machining problem, too! Take advantage of our experience.

Your nearby Gorham Field Engineer is a qualified cutting tool expert in both practical design and actual application, and his assistance is yours without obligation. Just write for his name, or send details of your problem direct to us. We'll have him get in touch with you promptly.

**Gorham TOOL COMPANY**  
"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

14407 WOODROW WILSON • DETROIT 3, MICHIGAN  
WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne, Calif.  
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-119



just after fitting.

Only 10 to 15 minutes is required to fit this universal automatic stop which may be used on strippers 5/16-inch thick and up. Made in two sizes—3/16 x 5 inches and 1/4 x 6 inches—the stops are available for right or left-hand feeding and are adaptable to blanking, progressive and compound dies.

**T-3-1201**

## Inside Diameter Gage

Checking of inside diameters, such as O rings and snap ring grooves, may be improved with the use of the recently introduced Diametrick. The dial indicator measuring instrument developed by Mutual Engineering Service, 402 Court St., Saginaw, Mich., embodies several features of a height gage. Standard Model "A" Diametrick will check holes from 1.375 to 3.625 inches in diameter, and will expand to measure grooves as deep as 1/4 inch. Other sizes are available for smaller and larger bores.

Originally, the instrument was developed for use in plants producing hydraulic cylinders for airplane application. However, its versatility, wide



range and low cost has broadened its use into many fields. Economy and efficiency are effected through use of this single gage to meet several general requirements.

Important features of the gage are that it offers positive indicator readings instead of "feel", is easily set to masters, gage blocks, micrometers and snap gages; all bearings and adjustments are outside of work; uses only range necessary to gage within the tolerance limits and is therefore easy on indicators.

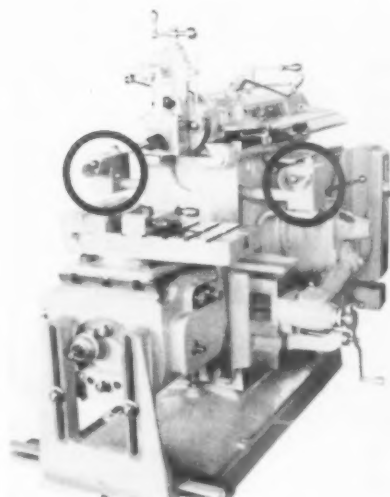
In use, the Diametrick is held with

the lower gaging arm resting on the work, permitting rocking of upper arm in all directions. It also may be used as a caliper in the toolroom and experimental department.

**T-3-1202**

## Dual Control for Shaper

Extra feature for the electro-magnetic brake and clutch on Cincinnati metalworking shapers is offered in the form of dual control. This additional control permits more efficient handling of large awkward work which obstructs the operator's view from the normal



working position. The electro-magnetic clutch itself is standard equipment on Cincinnati shapers.

Other special features which have been added to this machine to further increase operator efficiency are: automatic tool lifter, power down feed to the head with automatic stop and an auxiliary front cross feed screw.

Further information may be obtained from The Cincinnati Shaper Co., Hopple, Garrard & Elam Sts., Cincinnati 25, Ohio.

**T-3-1203**

## Silicon Grinding Wheel

Following five years' development, a series of silicon carbide wheels for grinding tungsten carbide tools is announced by The Fuller Merriam Co., 70 Water St., West Haven, Conn. The wheels cut faster and much cooler than those previously available, and field tests show substantially longer life in use. Superior qualities are attributed by the company engineers to new ingredients in the vitrified bond combined with a distribution of the abrasive particles calculated to enable them to penetrate and cut tungsten carbide with maximum efficiency.

The wheels will be marketed under trade name SiClone.

**T-3-1204**

THE PERFECT MATE FOR ALL FINE INSTRUMENTS OF STANDARDS

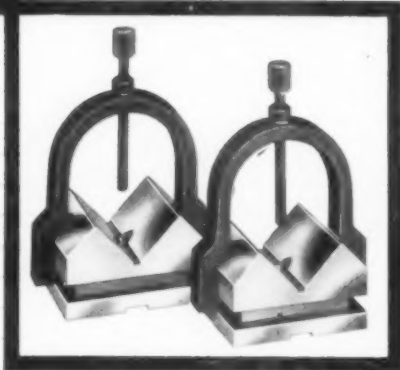
## UNI-V-BLOCK by Precision Tool

Made of close grain, stabilized Chrome-Moly alloy to guarantee precision results every time. The exclusive new FROZONE process, for hardness and stability, makes UNI-V-BLOCKS the closest thing to absolute perfection, on the market today!

Shown here is MODEL No. 3000 (2 1/2 x 3 1/4 x 2 1/8")

UNI-V-BLOCKS are also available as:

MODEL 5000 (4 1/8 x 5 1/8 x 5 1/8")  
MODEL 1250 (1 1/4 x 1 1/4 x 1 1/8")



ACCURATE TO WITHIN .0002" T.I.R.

PRECISION TOOL & MFG. CO. OF ILLINOIS  
1305A S. Laramie Ave., CICERO 50, Illinois  
Gentlemen: Please send me complete data on the new UNI-V-BLOCKS, at no obligation to me.

FREE! WRITE NOW FOR MORE INFORMATION!

PRECISION TOOL & MFG. CO. OF ILLINOIS

1305 S. Laramie Avenue  
CICERO 50, Illinois

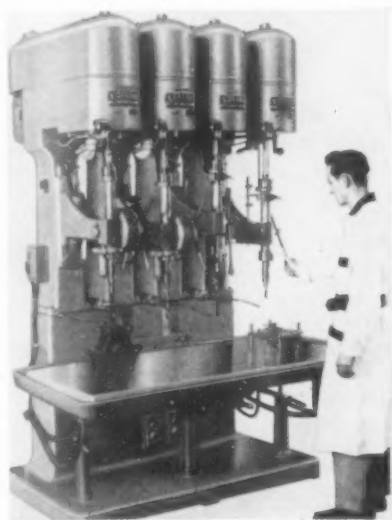
NAME \_\_\_\_\_  
COMPANY \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_

FOR FURTHER INFORMATION, USE READER SERVICE CARD, INDICATE A-3-120

## Drilling and Tapping Unit

A drilling and tapping machine, manufactured by the Edlund Machinery Co., Cortland, N. Y., provides infinite variable speed drive which allows the operator to select correct speed instantly with no lost production time for changing gears or belts. This quick selection of correct speeds in a broad range, contributes to maximum tool life as well as increased production.

Speed changes on the Edlund Model 2F are made with a handle controlled mechanism conveniently located for the operator. An indicating dial shows the speed selected. Spindle speeds ranging

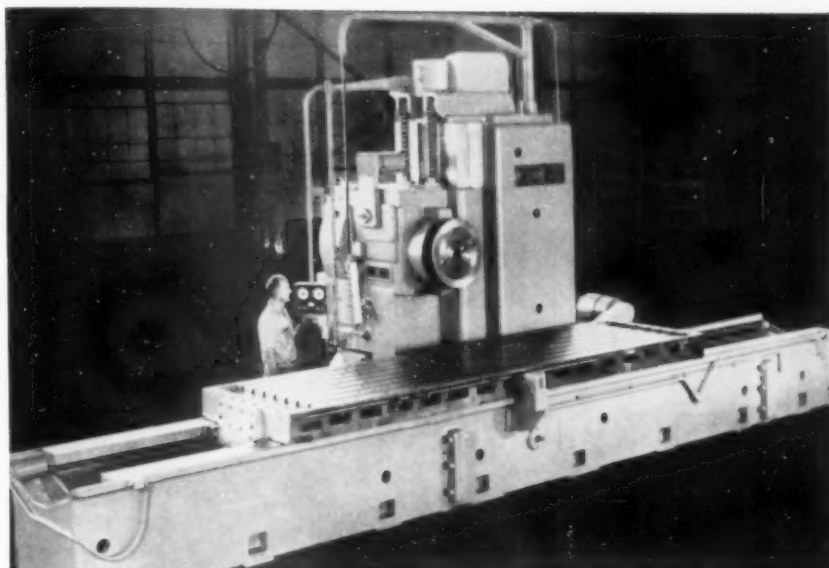


from 200 to 3600 rpm with three intermediate speed ranges are standard and with the back gear attachment an additional range of speeds from 50 to 900 rpm are obtained. The capacity of the machine with back gears is  $\frac{7}{8}$  inch for steel,  $1\frac{1}{4}$  inch for cast iron. Models with 8 inch and 15 inch overhang and from one to eight spindles are available in the pedestal type machine; 8-inch and 15-inch and overhang round column type machines are also in the line.

Other additional Edlund equipment for the Model 2F machine includes semi-automatic power feed which engages automatically as the drill touches the work; reversing motor tapper, capable of tapping 30 holes per minute and reversing at the same depth within  $\frac{1}{4}$  turn of the tap; the Edlund lead screw tapper, with adjustable stops and interchangeable pick off gears, and giving better quality finished tapped holes plus remote control operation.

T-3-28

USE READER SERVICE CARD ON PAGE 133 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION



## Heavy Duty Mill

The Sundstrand Machine Tool Co., Rockford, Ill. has designed and built a new and larger Rigidmil, intended for heavy work such as milling die blocks from rough prior to cutting impression and removing the old impression before recutting on used die blocks.

This machine, designated Model 77

Rigidmil, has vertical feed to head in combination with longitudinal table feed so that an automatic square cycle can be obtained for rough milling of die shanks. Automatic cycle or manual operation of the machine can be set up with the scale attached to the vertical head and an adjustable pointer on the bed.

The basic standard machine has a

## Are you losing profits . . .

. . . among those criss-crossing, back-tracking production lines resulting from additions to your original facilities? It's not uncommon these days, and when it happens, production economy and profits suffer.

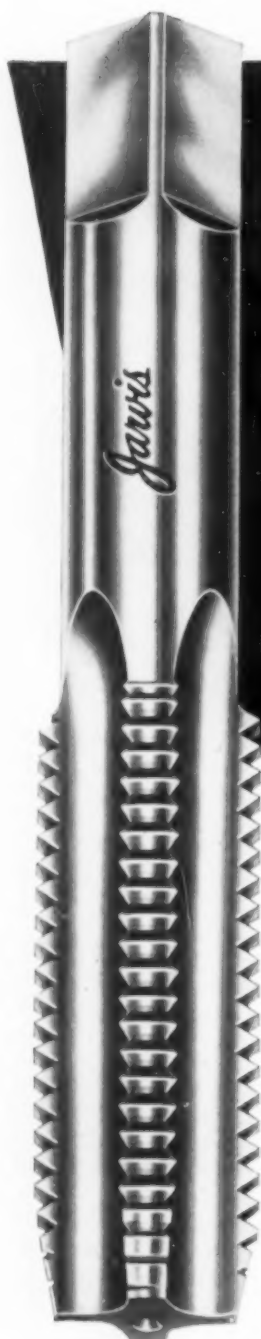
Pioneer has production engineers with new ideas backed by years of experience who can bring a fresh approach to your problems, locating and solving production difficulties, increasing productivity and cutting costs.

In 23 years, we've gained recognition for our services, particularly plant layout. By preparing process flow charts that reveal possible bottlenecks, utilizing template or scale model layouts for detailed study and from experience, we develop a flexible arrangement for maximum productivity. We work in close cooperation with your engineers, strengthening rather than supplanting their work. Or, we can assume the complete responsibility for a program if desired.

For detailed information on what we can do for you, call, write or wire today. Pioneer will be happy to discuss its services with you. There is no obligation.

**Pioneer ENGINEERING & MANUFACTURING CO., INC.**  
19651 JOHN R ST. • DETROIT 3, MICH.  
Telephone - TWInbrook 3-4500

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-121



# Jarvis TAPS

AN INDUSTRIAL TAP FOR INDUSTRIAL USERS

have "Custom Made"  
Cutting Edges at  
NO EXTRA CHARGE



PULLEY  
TAPS



NUT  
TAPS



HAND  
TAPS

"Custom Made"  
means just that! Accurate  
indexing and precision machine grinding  
of flute and spiral points on Jarvis  
Taps produce a tool in which ALL the  
cutting edges do their share of the work.  
Our highly accurate fluting process  
makes it possible for us to control for  
your PARTICULAR NEEDS the amount of  
hook ground in the flutes. Specify Jarvis,  
and you'll always have "Custom Made"  
Taps designed to do a specific job super-  
bly well.

## JARVIS POWER TOOLS

include:

TAPPING ATTACHMENTS  
TAPS - FLEXIBLE SHAFTS  
AND MACHINES  
ROTARY FILES  
TUNGSTEN CARBIDE  
REAMERS AND MILLS  
DRILLS - BORING BITS

Send for complete Tap  
Catalog now—also name  
of your nearest Jarvis  
representative.



THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-122

48 inch wide table and can be fur-  
nished with feed strokes of 14, 168,  
192 or 216. Both longitudinal move-  
ment of the table and vertical move-  
ment of the head have variable feed  
drive with meters in the pendant control  
unit indicating the rate of feed in  
inches per minute.

The spindle head is of the horizontal  
type and has either a 60, 75 or 100 hp  
spindle drive motor. A meter on the  
control panel indicates percent of full  
load current on the spindle motor.  
Speed changes are by pick-off change  
gears. A variable speed drive for the  
spindle head can be furnished as op-  
tional equipment. T-3-1221

## Gear Checker

An instrument which provides the  
type of measurement designated by the  
A.G.M.A. as a "composite check," by  
which all gear errors are measured in  
combination, has been developed by  
The Fellows Gear Shaper Co.

Errors in gear tooth elements cause  
changes in velocity or in center dis-  
tance. The latter principle is the basis  
upon which the Fellows Fine-Pitch Red  
Liner operates. The master gear is  
mounted on an arbor in a movable  
spring-loaded carrier and can be ro-



tated either by a handwheel or by mo-  
tor. It is meshed, without backlash,  
with the work which is located in a  
fixed holder or on fixed centers. As  
master and work rotate in close con-  
tact, any variation in center distance  
is measured and recorded on a con-  
stantly moving paper chart. Center  
distance variations are detected by an  
electrical sensing device whose output  
signal is amplified to operate an elec-  
trical recorder. Amplification can be  
made 200 to 1, 400 to 1, or 800 to 1, by  
means of a simple adjustment.

When motor driven, speed of rotation  
of the master gear can be varied, so  
that tooth velocity will be maintained  
at the best operating condition. Pres-

The Tool Engineer

sure between the master gear and work is adjustable to conform with the A.G.M. standards for measuring fine-pitch gears.

The instrument can be furnished as bench type or with a cabinet. Headstock and tailstock centers, and a 1/10,000-inch dial indicator for visual inspection without a chart, are furnished as standard equipment. The headstock center is held in a V and can be replaced by a stationary arbor when desired.

**T-3-1231**

## Level Attachment for Drills

This simple practical and easy-to-use level, called the Dril-Level, has been designed for drilling holes at any angle with accuracy. It is a product of the M & J Specialty Co. of Red Hook,



Dutchess County, N. Y., manufactured for them by Smithers Tools and Machine Products, Inc. of Red Hook, N. Y., and being distributed by manufacturer's representatives.

The Dril-Level, which can be attached to the housing of any portable drill in less than a minute, consists of a circular bubble level mounted on a graduated bracket which is calibrated from 0 to 90 degrees.

**T-3-1232**

## Fan Cooled Motor

Reuland Electric Co., Alhambra, Calif., has introduced a motor which incorporates a high-velocity internal cooling fan. As a result of this feature, much higher horsepower ratings can be obtained from lower cost, small frame sizes. For example, a 30-hp motor, which ordinarily requires a No. 365 frame, is built into a No. 326 frame. A 13-in. diam. fan is mounted on the motor's shaft and is housed within the special fin-type endbell. Air is sucked



AN INDUSTRIAL MACHINE FOR INDUSTRIAL USERS

For Multiple Tapping  
and Drilling . . .

# Jarvis MULTI-TAPPERS

Engineered and built to your specific production requirements from our basic standard components, Jarvis Multi-Tappers can be furnished for any type of drill press available.

We invite your inquiries—let us assist in analyzing your tapping and drilling needs!

Send for our catalog featuring  
Jarvis Multi-tappers

## NEW FEATURES OF JARVIS MULTI-TAPPERS

include:

- Aluminum case—Jig bored.
- Gear driven—positive action, silent drive.
- Ball bearings throughout.



WHEN POWERED WITH A JARVIS TORQOMATIC DRIVE THE JARVIS MULTI-TAPPER PROVIDES THE MOST EFFICIENT AND PRODUCTIVE MACHINE IN THE FIELD.

**THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT**

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in through a screen filter opening and blown with great force over all internal areas.

Reuland high-velocity fan cooled motors are available in ratings from 15 through 30 hp. All units feature a drip-proof construction and can be furnished with either a standard single-end shaft or special hydraulic pump mount endbells. **T-3-1241**

USE READER SERVICE CARD ON PAGE 133 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Gage for Rolling Mills

Designed to measure the thickness of strip on small, compact cold reduction mills, a new model AccuRay radiation gage has been introduced to the steel industry by Industrial Nucleonics Corp., Columbus, Ohio. A measurement range of 0.00005 inch to 0.060 inch is provided by the new model.

Streamlined for close-quarters mounting, the new measuring unit is 10½ inches high, 4½ inches wide, and 26 inches long. It is positioned by a lead screw mechanism which enables

it to traverse strip up to six inches in width.

This noncontacting gage features an automatic standardization cycle which periodically enables the gage to compensate for error-producing variables such as changes in temperature, humidity, and dust collection on the radiation window. This feature avoids possibility of human error which might occur for operating personnel inserting standard samples or adjusting dials to manually standardize the gage.

The regular AccuRay recording console is used with the new model, providing a permanent record of each coil reduction and permitting extreme flexibility for the setting of thickness ranges. **T-3-1242**

# 110 Million Run!

## WITH THE SAME DICKERMAN FEEDS!

HERE ARE AMAZING, ACTUAL PRODUCTION FACTS ON FEEDING STOCK FOR ARMY RIFLE CLIPS!

### EQUIPMENT:

3 - 105 TON FERRACUTE PRESSES  
3 - DICKERMAN DIE FEEDS

### SPEED:

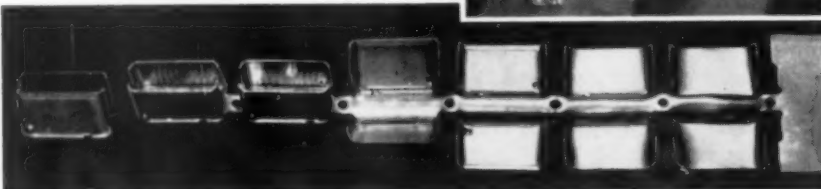
80 TO 85 PIECES PER MINUTE

### PRESS TIME:

OVER A YEAR ON 3 SHIFTS —  
24 HOURS PER DAY

### PRODUCTION:

90,000 PIECES PER FEED, PER DAY  
110,000,000 PIECES PRODUCED TO  
DATE — WITH FEEDS STILL OPERAT-  
ING IN ACCURATE, SERVICEABLE  
CONDITION!



Die ribbon from one of three 10 station progressive dies. Extreme proving ground accuracy is vital on every press stroke.

These are not claims, they're actual, cold — dollars and cents production facts. On your next punch press job, if production is a factor — if parts cost is a factor — if press speed is a factor — You can't afford not to use a Dickerman Feed!

# Dickerman

**H. E. DICKERMAN MFG. CO.**

324 - 219 ALBANY STREET

SPRINGFIELD, MASS.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-124

### SEND TODAY

for literature and CATALOGS on the complete, dependable line of DICKERMAN FEEDS.



## Stamping Calculator

Pertinent specifications for small and medium size stampings may be determined from with the inexpensive calculator placed on the market by Bao Slide Co., P. O. Box 7902, Chicago 80, Ill.

With a single setting, the calculator will give answers for: blank diameters of cylindrical shells; number of drawing operations needed for producing the shell, as well as diameter and height of the shell in successive draws; bending allowances for any stock thickness, inside bending radius and any bending angle; weight of any kind of material needed for making the stampings.

Printed on vinylite plastic, the calculator measures 4 x 10 inches. Accompanied by numerical examples to facilitate user's operation. **T-3-1243**

## Temperature Control

Partlow Corp. of New Hartford, N. Y. has developed a compact, nonindicating explosion-proof temperature control for application in many hazardous locations. In size, it is only 6½ in. high, 6½ in. wide and 3¼ in. deep, and it weighs 4½ lb.

Underwriters' Laboratories, Inc. have approved it for use in atmospheres containing ethyl ether vapor; gasoline, petroleum, naphtha, alcohols, acetone, lacquer solvent vapors, and natural gas; metal dust; carbon black, coal, or coke dust; and atmospheres containing grain dust.

The Model VS Control is designed to maintain temperature by controlling the flow of steam, oil, gas, or electricity which heats an appliance. It may also be used to regulate the flow of a coolant, to remove heat rather than supply it. It is especially suitable for controlling all types of appliances



where constant visual evidence of temperature is not required.

For simplicity of operation the Model VS can be supplied with a calibrated temperature scale which makes it possible to set the control temperature directly on the dial of the instrument.

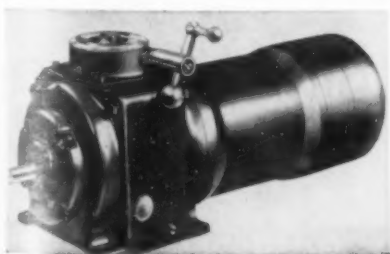
The uncalibrated control is offered for applications where close control is desired without disclosing the temperature of the process. Dials on uncalibrated controls are marked with divisions from zero to 50 which can be logged for duplication in setting.

Maximum rating of the switch used in the Model VS is 4 amperes at 125 volts, 2 amperes at 250 volts, noninductive for normal service. For pilot duty it is rated at 50 volt-amperes inductive load. The control is designed for use with either two or three-wire control circuits.

The Model VS is available with any of ten elements covering temperature ranges from -30 to 1200 F. **T-3-1251**

## Speed Drive with Built-in Brake

For the first time in such small sizes,  $\frac{1}{8}$  to  $\frac{1}{4}$  hp, variable speed drives with built-in magnetic disk brake motors are available from Graham Transmissions, Inc., Menomonee Falls, Wis. These brakes, using motors in the 42-48 frame, are only 5 inches in diameter and less than  $3\frac{1}{2}$  inches in length. They mount directly on the end of the motor and provide a compact package of motor, brake, variable speed trans-



mission and built-in reducer, all of which may be mounted with only four bolts. The unit provides instant stops, frequently required for indexing tables, welding positioners, tensile and compression testers, and other tools.

Main features include an external manual release automatic reset mechanism, friction elements which eliminate lining wear adjustments and replacements, and a brake enclosure applicable to both open and totally enclosed motors.

The transmission itself is also available without motor and can be had with a variety of built-in reductions, both spur and worm types, with output shafts extending horizontally or vertically. The transmission shown here is equipped with the standard micrometer control offering a straight line control which may be read accurately to  $\frac{1}{400}$  of the dial periphery. Remote mechanical, electrical or pneumatic control may also be had.

Extremely accurate control with ex-

## INSERTED BLADE TOOLS

...by Waukesha are  
Noted for their Economy,  
Adaptability and  
Adjustability

For more than a quarter century, Waukesha Inserted Blade Cutting Tools have been delivering outstanding value to users — in terms of overall economy. Their first cost is no higher than that of precision tools of similar scope and quality. The inserted blade feature and their adjustability greatly reduce the tooling investment — but their greatest contribution to economy lies in their proved ability to produce *more-holes-per-grind*, month after month and year after year. You pay *no premium* for Waukesha's *premium values*.

Ask Our Representative, or write for new Waukesha catalog No. 25

### consult WAUKESHA

For Competent Cutting Tool Counsel — to assist you in adapting standard Waukesha Tools to your needs — or in developing special tools for unusual requirements.



#### ADJUSTABLE — BLADE REAMERS

... for High Speed, Heavy Duty Service. Shear-cut angle blades for positive shearing action which prevents scoring. Stocked in  $\frac{1}{8}$ " to 6" diameter.



#### INSERTED BLADE SPADE DRILLS

Lower in cost than solid twist drills. Holder lasts indefinitely. Only the blades need be replaced. Stocked in  $1\frac{1}{32}$ " to 5" diameter.



**WAUKESHA TOOL CO. WAUKESHA WISCONSIN**

Manufacturers of Carbide and High Speed:

INSERTED BLADE REAMERS • SPADE DRILLS • TAP DRIVERS • BORING BARS • INSERTED BLADE COUNTERBORES • FLOATING TOOL HOLDERS • SPECIAL TOOLS.

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# NEW BIG CATALOG

NOBLE & STANTON STANDARD  
JIG & FIXTURE  
COMPONENTS



**Finest Quality Standards  
for Your Tooling Program  
at New Low Prices!**

**66 PAGES  
150 DRAWINGS**

Hundreds of new sizes and parts. Many exclusive items not available elsewhere. Advanced engineering features.

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INDICATE A-3-126-1

act speed holding and resetability may be had at all speeds from maximum to zero and full reverse if desired. The transmission is a compact, self-lubricated unit with built-in overload protection in the event of overload or a jam in the driven machine. **T-3-1261**

## High HP Capacity V-Belts

An improved "super-power" V-belt, designed to offer a horsepower capacity average of 40 percent over standard V-belts, has been introduced by Raybestos-Manhattan, Inc., Manhattan Rubber Div., Passaic, N. J.

With this belt, known as the R/M Super-Power V-Belt, narrower sheaves may be used on new drives, saving space, because fewer belts are required for the same power demands. In addition, it has practically no stretch thereby, effectively eliminating belt matching problems.

Test on the belt in severe operation indicates it gives exceptionally longer service, withstanding shock with great elastic resistance, and requiring less take-up maintenance and fewer V-belt replacements than those with which it was compared. The belt's construction is of all-synthetic rubber, and is also oil-proof, nonspark and heat-resistant. Descriptive folder No. 6628 is available on request. **T-3-1262**

## Metal Cleaning Concentrate

Introduction of a noncorrosive, ferrous metal washing compound for quick, thorough removal of quenching oils after heat treating has been made by Ipsen Industries, Inc. 715 S. Main St., Rockford, Ill. Ipsen washing compound 103 is designed for effective removal of oil, grease, lubricants, soils, lapping and drawing compounds.

Suitable for both batch and spray-type washers, the degreasing agent will produce metallurgically clean workpieces within 3 to 10 minutes in circulating-type washing equipment. Parts cleaned with this compound dry bright and clean without residue. Since soil particles are never held in solution, the solution remains at an effective level longer. Foaming characteristics of the compound are controlled to give optimum degreasing.

The compound will remove such "heavy soils" as drawing and buffing compounds, and other heavy oils and greases. It is noncaustic, safe for metal surfaces, odorless and nontoxic.

The degreasing agent is a fine, granular mixture of alkaline materials combining detergents and surfactants. Ipsen compound 103, with a new and differ-

Balancing For  
Mass Production

**"HI-EFF"**  
BALANCING  
MACHINES



**FAST! . . . .  
and ACCURATE!**

- FANS
- IMPELLERS
- GRINDING WHEELS
- TIRES
- BRAKE DRUMS
- SHEAVES
- PULLEYS
- MANY OTHER APPLICATIONS

DYNAMOMETERS • STATIC BALANCERS  
PRECISION DRILLING MACHINES

**TAYLOR DYNAMOMETER  
AND MACHINE COMPANY**

6411 River Parkway  
Dept. E-3, Milwaukee 13, Wis.

INDICATE A-3-126-2

ent cleaning action, eliminates the need for a secondary washing operation. Quick "wetting" and fast soil penetration reduces washing time and, on manual jobs, eliminates any need for pre-soaking. Compound 103 gives the same quality results whether used in the Ipsen automatic washer or in other batch and spray-type washers. A modified compound 103, designated Ipsen Metal Washing Compound 107, provides increased solubility and is available for certain unusual conditions sometimes found in use of spray type equipment.

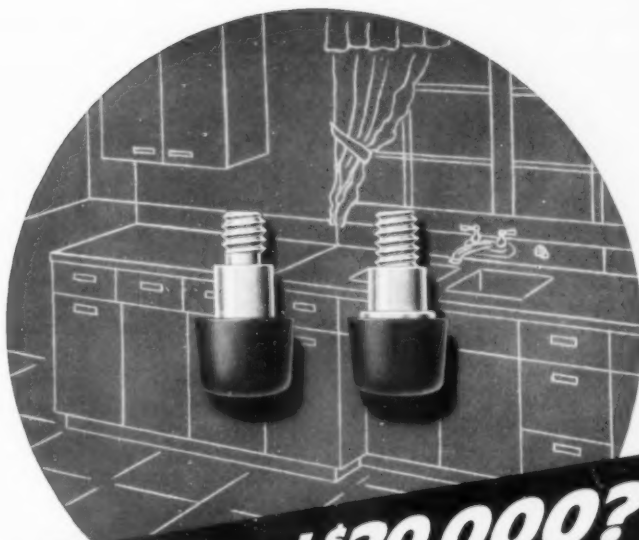
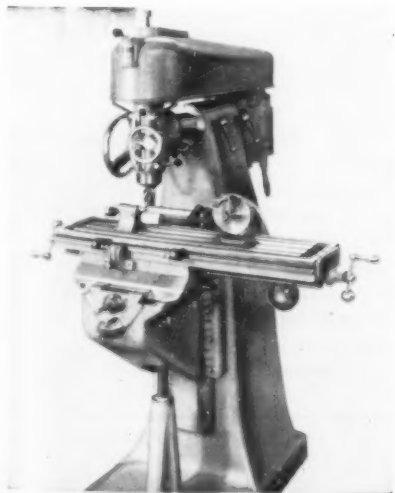
Because it is concentrated, less than one ounce of the washing compound per gallon of water provides an efficient degreasing solution for either batch or spray-type washers. Tank charging is simple and easy with only 18 pounds needed to charge a 250-gallon tank, as compared to 75 and 90 pounds of ordinary nonconcentrated compounds. Compound 103 is available in bulk quantities and is also packed in handy "load-size" 18-pound polyethylene packages which simplify stocking, handling and avoids tendency to over-charge.

USE READER SERVICE CARD ON PAGE 133 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

### Versatile Milling Unit

Accurate, versatile, vertical and angular milling may be efficiently and economically accomplished with the United States Vertical milling machine by U. S. Burke Machine Tool Div., Cincinnati Mfg. Corp., Cincinnati 27, Ohio.

The machine is a companion to the U. S. Burke time-tested "U. S. No. 1" horizontal miller. Features and improvements incorporated into the vertical model include balanced rigidity,



**Which part saved \$20,000?**

They're practically look-alikes. Both were designed to serve as rubber-tipped leveling screws on the bottom corners of metal kitchen cabinets. The part on the right does much the better job — its special collar prevents the rubber cap from slipping over the shank. Produced on COLD FORMING equipment, it costs \$6.00 less per thousand than the screw machine part previously used!

**Result:** Savings of over \$20,000 a year for one of America's leading makers of kitchen cabinets!

### COLD FORMING and Good Design turned the trick!

Your annual investment for fasteners and small special parts is, undoubtedly substantial in your plant. Savings that total thousands of dollars are not unusual when such parts are COLD FORMED without waste or scrap on high-speed automatic equipment and designed for high-speed automatic or semi-automatic application.

Thanks to long experience in COLD FORMING, Milford engineers, designers and product

research experts are ready and able to help you cut small-parts costs substantially. They bring to your service Milford's leadership and know-how in the manufacture of semi-tubular, tubular and special rivets, as well as automatic rivet-setting machines.

So put us to work for you — on products you're making now or those you're planning to produce. Chances are we can help you make some major savings — in both time and money!

Write or phone nearest Milford Plant or Sales Representative!



**MILFORD RIVET & MACHINE CO.**

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ELYRIA  
OHIO

AURORA  
ILLINOIS

HATBORO  
PENNA.

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simplified belt changing, conveniently mounted switch, and tool storage compartment in the base. Designed particularly for flexibility at a reasonable price, this large-capacity vertical milling machine offers improved facilities for vertical boring, end milling, dovetailing, etc.

The vertical table provides an expansive 9½ inch by 36 inch working surface. Quill travel is 5½ inches. The entire head is accurately balanced by mounting the motor behind the supporting column. The guard (hinged on head) and motor can be easily raised to simplify the changing of the belt to any pulley position.

Its approximately 1600-pound weight is designed to create an extremely stable base. Floor space required is only 60 by 75 inches. **T-3-1281**

## Automatic Broach Loaders

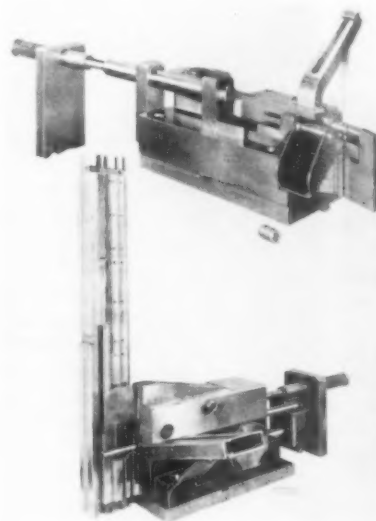
Automatic loaders, designed to speed output of externally broached round parts on conventional dual ram vertical broaching machines, are announced by National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich.

Made in a wide variety of types to accommodate specific parts, these Red Ring loaders feature magazine feeds and simple, compact feed, clamp and eject mechanisms. No auxiliary power source is required to actuate the loader mechanisms since the in-out-out travel of the dual ram broaching machine tables is utilized to impart motion to the loader feed and clamp components.

Round parts on which flats or slots can be surface broached are especially adapted to Red Ring automatic loader

applications. Output of the loaders is limited only by the speed of the machine. An operator keeps the feed magazine full and the finished parts are automatically ejected into trays or tote boxes.

Magazine feeds are designed to prevent parts from entering the loaders in incorrect endwise location for broaching. Motion toward the front of the



machine causes a clamping cam to rotate out of position behind the clamp jaws.

These jaws are then retracted by another control rod attached to the loader control plate, during which time the part is pushed off into the unloading chute by spring-loaded fingers.

With the loader fully retracted, a part enters the clamp jaws from the magazine feed. As the loader approaches the broaches on the return stroke, the part is advanced to clamping position past the fingers by the lower control rod. It is securely clamped in position for broaching near the end of the table travel by the clamping cam, which is rotated into position behind the clamp jaws by the upper control rod. Clamping pressure is controlled by a spring on the end of the rod.

The unloading chute is swung out of interference with the broaches during the broaching operation by the ram.

An automatic loader can be mounted and a part produced with each ram stroke. It is possible to mount loaders handling different parts on each table and broach two different parts on alternate ram strokes on a single broaching machine. **T-3-1282**

## AN IMPROVED STANDARD COUNTERBORE DESIGN by ECLIPSE

**NEW!**

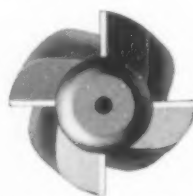
### FLUTE DEVELOPMENT GIVES YOU

- ★ Deep counterboring with a wider range of pilot sizes.
- ★ A higher helix angle which assures faster chip disposal.
- ★ New tooth construction thus providing maximum heat dissipation.

### The DIFFERENCE at a glance!



End view of counterbore showing conventional flute form, designed for spot facing and shallow counterboring.



New style flute form designed for spot facing and deep counterboring; chips can flow freely from pilot diameter.



Side view of counterbore showing conventional flute design which provides ample chip clearance for shallow counterboring and spot facing.



New style flute form with increased helix angle permitting faster chip removal, thus reducing heat to a minimum in deep counterboring.

**ECLIPSE COUNTERBORE CO.**

Founded in 1913

DETROIT 20, MICHIGAN

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USE READER SERVICE CARD ON PAGE 133 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Multiple Nut Setter

A multiple nut setter that will set from two to five nuts simultaneously—each to an individual torque—has been announced by the Keller Tool Co., Grand Haven, Mich. Quality control tests indicate that with this tool, a torque deviation of three percent or less on the production line is entirely feasible.

Each motor unit has an integral torque regulator that is easily adjust-



able over the entire range of the motor. Once the regulator is set, the setting is held indefinitely.

Another outstanding feature is its flexibility. The only specially made part is a mounting plate which positions the motor units. Plates are made of  $\frac{1}{2}$ -inch steel, and can be made up as needed in any machine shop or tool-room. The motor units are bolted to the mounting plate and are easily removed for conversion to other production jobs.

Four motor units cover the range from 20 to 120 foot-pounds. Offset spindles make setting possible when bolts or nuts are closely spaced, and finding nuts or bolt heads is a simple matter with axially resilient socket adaptors.

**T-3-1291**

## Jig Borer

A jig borer of interesting design is being offered by Manufacturers Associates, 92 Liberty St., New York, N. Y.

Outstanding feature of the unit, designed and made by Maschinenfabrik Dianawerk of Germany, is that it is operated from a central panel board at the front of the machine. The spindle speeds and quill movement, both infinitely variable, are driven by a hydraulic system.

Spindle speeds are divided into two ranges—one low, from 60/380 rpm;

and one high, from 360/2200 rpm—and both can be read from the tachometer. Changes from one range to another can be accomplished, without stopping the spindle, by means of push buttons on the control panel.

The spindle, made of hardened tool steel, has three special roller bearings. This makes possible assurance of a circular movement around the axis of the head with an accuracy of 0.00003 in. Quick and accurate tool changes are facilitated by a special taper with an inside No. 3 Morse Taper developed by Dianawerk engineers.

Location of the electric controls and the hydraulic system in a separate cabinet away from the machine not only results in a safety feature, but avoids heating and vibration in the machine itself, thus increasing the jig borer's accuracy.

**T-3-1292**



## Have you heard the one about the farmer's daughter ?

**That's** a joke—but idle machines and operators aren't! Lost production time shows up in decreased operating profits. Four machines are idle while these men wait their turns at the grinder to sharpen their tools.

Prevent such "jam sessions" in your shop by providing enough grinders.



**Hisey "Economy" Grinders**, for tool and miscellaneous grinding operations, are low in original price, and save time which is money. The Hisey is fast-pay-out equipment.

Motor is completely enclosed. Husky, alloy steel shaft is ball bearing mounted . . . sealed to keep lubricant in and dust out. The Hisey "Economy" Grinder is of ample weight, scientifically distributed. This insures vibrationless operation—good grinding results. There's a Hisey "Economy" Grinder to handle your smallest or largest tool— $\frac{1}{4}$  to 7 $\frac{1}{2}$  H.P. capacity . . . for 6 inch to 20 inch wheels.

Ask for Catalog 72 EL

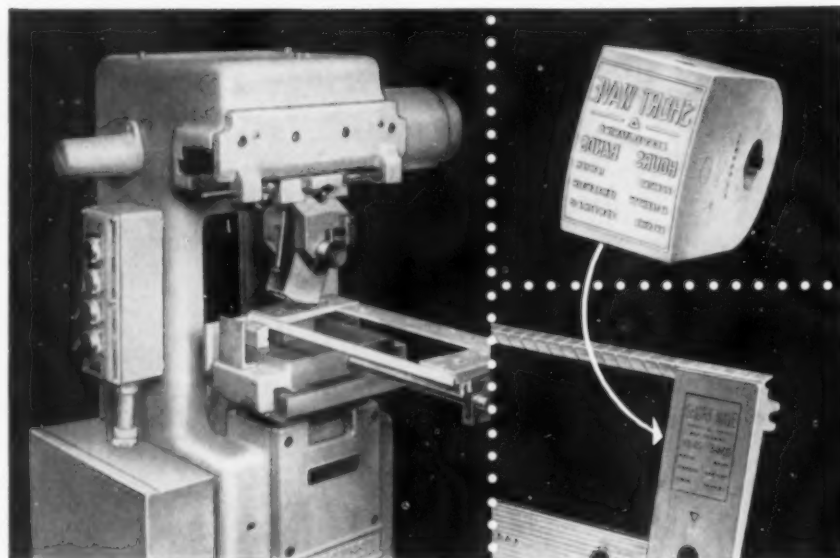
**Hisey THE HISEY-WOLF MACHINE CO.**  
CINCINNATI 8, OHIO  
Division of The Cincinnati Electrical Tool Co.

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LEADERS IN INDUSTRY MARK WITH NOBLEWEST

## RECIPROMATIC

### MULTIPLE PASS ROLL MARKING MACHINE



Noblewest's RECIPROMATIC Model 50P1 used for marking portable short wave radio panels with a sharp, permanent, extra-deep impression. Upper right shows Rocker Marker Die and marked panel below.

- For Extra Deep Marking
- For Normal Depth Marking on Fragile parts

**A**NOTHER NOBLEWEST mark of achievement! This job required unusually deep marking on die cast parts which would have been fractured by marking the impression with straight pressure. But with the Noblewest Recipromatic, a permanent, extra deep impression was rolled into the metal by several passes of the die . . . without distortion . . . or fracture. Among the many features of this Recipromatic ROLL-O-MARK all-pneumatic marking machine is a special control circuit which permits any number of roll marking passes to a given part

. . . air-operated work table which provides uniform marking pressure and compensates for dimensional variations in piece parts.

Whatever your needs for metal marking, Noblewest makes the machines, tools and dies for doing the complete job faster, better at lower cost. And remember, Noblewest Roll-Marking is permanent marking—good for the life of your product. There is a Noblewest representative near you. Write to Noble & Westbrook Manufacturing Company, 15 Westbrook Street, East Hartford 8, Connecticut.

Copyright, 1954—Noble & Westbrook Mfg. Co.

MARK IT BEST WITH

# NOBLEWEST

ORIGINATORS OF THE ROLL MARKING PROCESS

MARKING

NUMBERING

GRADUATING

EMBOSSING

DIES-FIXTURES

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## Universal Coupling

A new type of universal coupling, operating on the ball and socket principle is available for all types of machinery requiring coupled shafts either at an angle or straight line.

The unit features simplified construction with a reduced number of working parts. The essentials of the unit consist of a ball, fitting into a socket with the stress of power transmission absorbed by two oversize keys. The entire assembly is held in place by a



rolled and crimped cap. Bearing surfaces are heat treated and machined to close tolerances.

A reservoir in the base of the socket retains lubricant for slow feeding to points of wear.

The absence of the customary block and pins provides a small unit in relation to the size shaft it will turn. It has a maximum deflection of 30 degrees and is as strong as the shaft it is bored to receive. It is particularly effective at medium and high speeds.

The coupling lends itself well to all types of machinery, both new and for maintenance replacement in machinery already in service.

Full details are supplied in the manufacturer's bulletin #185 issued by the B. M. Root Co., York, Pa. T-3-1301

## Precision Lathe

Infinitely variable spindle speeds with single dial control are the features of the general purpose precision lathe introduced by the Hendey Machine Co. Torrington, Conn. Speeds (of this Hendey No. 2E unit, equipped with electronic motor control, can be changed while machine is under cut.

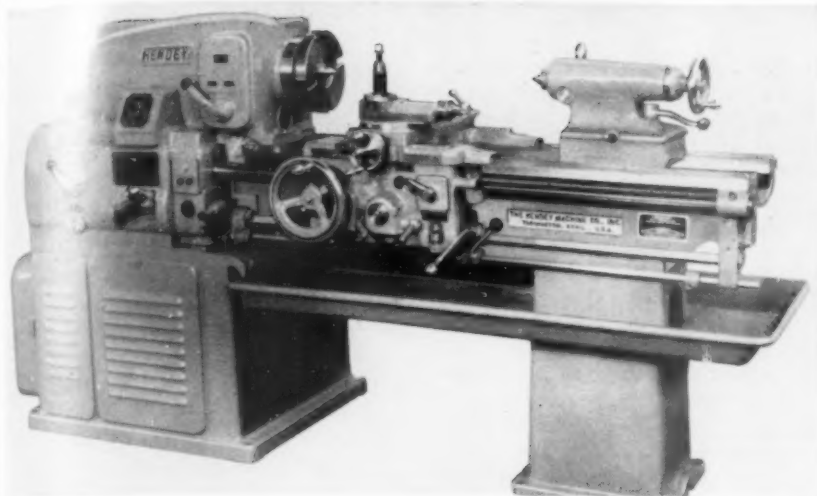
The electronic drive contains only three 18 amp, heavy-duty rectifier tubes in the power circuit, and one smaller rectifier tube in the control circuit. Positive, no-slip belt drive is provided between motor and work spindle. Step-

## Cutting Oil

Several improvements in its Sunoco Emulsifying Cutting Oil have been made by the Sun Oil Co. at a result of improved refining techniques. Improved S.E.C.O. mixes easier with hot, cold, and hard water; forms whiter and more stable emulsions, and a lowered viscosity makes it easier to handle.

In addition, it also may well be used in hot emulsion-type washers, for hot rustproofing and for cold rolling steel.

Advantages of improved S.E.C.O. are described in a Sunoco Technical Bulletin, obtainable from either the Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa., or Sun Oil Co., Ltd., Toronto, Ontario. **T-3-1313**



less speed, ranging from 15 to 150 rpm is provided by potentiometer control of both field and armature of the 5 hp. d-c motor, while close speed control is achieved even under changing load. Full torque is attained at low speeds over the complete armature control range by means of I. R. compensation.

Due to provisions for extra capacity and the unit's inherent ruggedness, current limiting is unnecessary. A thermal overload relay protects the motor from sustained overloads. The unit is unusually quiet during operation, even under load.

Instantaneous electric dynamic spindle braking plus start, stop and reverse are controlled by duplicated single levers at the headstock and apron.

**T-3-1311**

USE READER SERVICE CARD ON PAGE 133 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Cam-Locking Rotary Table

Intended for quick manual rotation for use in assembly and subassemblies, this improved cam-locking rotary table can support a substantial weight and can be locked in any position. It can be used for all assembly operations of small and medium-size parts such as scrapping cross slides of a lathe, drilling and tapping various holes around a part in assembly and minor machining operations.

The table is hand scraped on two bearing surfaces to fit the cast iron base. Locking is accomplished by quick action cams, and the center bearing is adjustable to take up any wear that may occur. Periphery of table can be graduated in degrees and quick position for any antular movement.

Further information may be obtained from the maker, Troyke Mfg. Co., 4422 Appleton, Cincinnati, Ohio. **T-3-1312**



**Are You Overlooking  
A WAY TO CUT  
YOUR TAP COSTS  
UP TO 75%?**

**You May Be... If You Haven't Investigated the**



Leading metalworking concerns now using the B.P.S.\* System have reduced their tap cost by 50 to 75%. These B.P.S.\* benefits can be yours!

### WHAT IS THE B.P.S.\* SYSTEM?

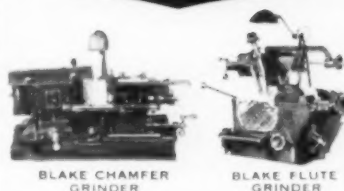
It consists of two basic ideas: (1) Sharpening the flutes and chamfers of taps to an exceptionally high degree of accuracy (possible only on Blake grinders) and (2) Sharpening your taps at regular, planned intervals.

### HOW DOES THE B.P.S.\* SYSTEM REDUCE COSTS?

By using the Blake Chamfer Grinder and Blake Flute Grinder, your operator can sharpen each tap precisely—to exactly match a previously determined index and rake angle. This enables each tap to cut much more accurately with less strain, thereby greatly increasing tap life. This superior sharpening method makes taps last many times longer!

\*Blake Precision Sharpening

**HERE'S WHAT THE B.P.S.\* SYSTEM CAN DO FOR YOU!**



- Gives much more production per tap!
- Greatly reduces tap costs!
- Provides greater tap accuracy and uniformity!
- Greatly reduces tap breakage and spoiled or unacceptable work!

### INVESTIGATE THE B.P.S.\* SYSTEM NOW!

Write us for reprints of *American Machinist* and *Machinery* articles on this subject. Descriptive folders on both Blake grinders also available.



**EDWARD BLAKE COMPANY**

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March, 1954

131

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132

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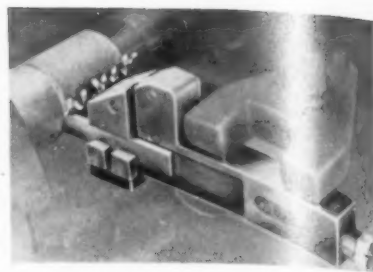
## Toolholder

Absorption of vibrations and shocks, occurring when turning rough surfaces or other than round work, is a special feature of the toolholder introduced by American Tooling Corp., 60 E. 42 St., New York, N. Y. As a further advantage, the toolholder maintains a constant cutting angle.

The new toolholder, known as the Recoiler, prevents breakage of bits, prolongs cutting tool life, and permits higher machine tool speeds.

The head of the Recoiler is connected to the body by a specially designed linkage which holds the cutting tool at a constant angle.

All shocks and vibrations are transmitted to a rubber spring pack, located inside the shaft of the toolholder, and which can be regulated to absorb shock by adjusting a stop-bolt at the end of



the shaft of the Recoiler.

The same Recoiler can be used for left or right-hand operations and for cutting, parting, and threading. Available with the holder are high-speed cobalt bits and carbide toolbits in all standard forms and grades. T-3-1321

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## Automatic Welding Fixture

Flexibility is among the main features of the automatic welding fixture introduced by C. B. Herrick Mfg. Corp., 1935 Euclid Ave., Cleveland 15, Ohio.

This ram-type machine, model CB 6x6, is designed to produce faster, better and lower cost automatic welding.

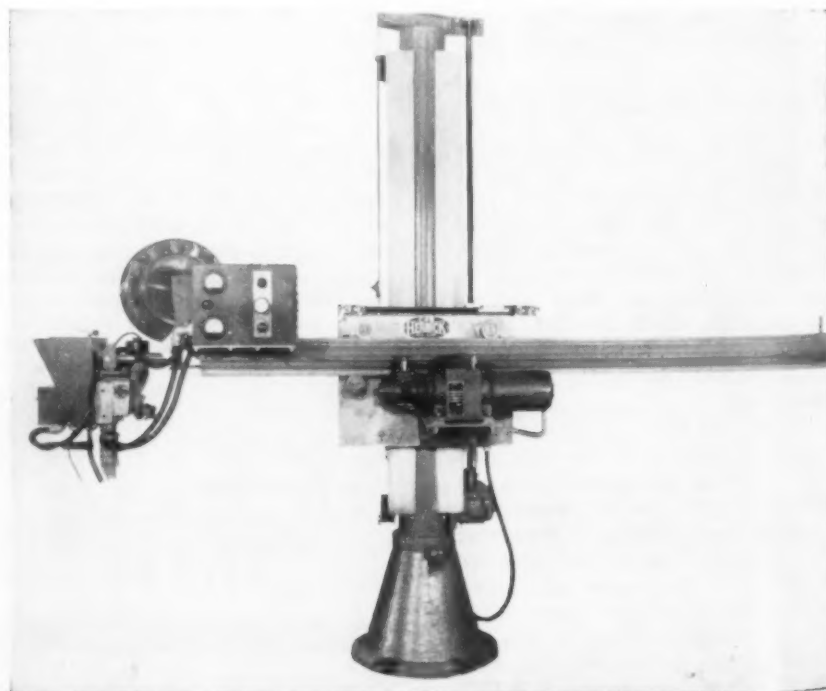
The tubular lateral ram, with automatic head attached, travels 6 foot, 6 inches over the positioned or rotating work. Variable speed drive provides welding speed range of 0 to 100 ipm. Motorized vertical adjustment ranges from 13 inches to 6 feet. The tubular

column containing counterweight, and the ram, rotate 360 degrees. The head mounts easily on the ram.

The CB 6x6 may be mounted on a carriage to travel longitudinally on special track. Any length track may be used, coming in 10-foot lengths. Track speed also is variable from 0 to 100 ipm.

Welding generators and flux recovery equipment may be mounted on the carriage. All fixture control is centralized in a small hand pendant.

Two larger models, one with 8-foot lift and 10-foot ram travel, the other with 10-foot lift and 12-foot ram travel, also are available. T-3-1322



The Tool Engineer

# THE TOOL ENGINEER'S *Service Bureau*

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

Literature Number	COMPANY	DESCRIPTION
A-3-169	F. E. Anderson Oil Co., Inc. ....	Chemical Coolants—"Lusol Gets to the Point" describes the use of Lusol and how it is performing in various types of metalworking machines. (Page 169)
A-3-155	Armstrong Bros. Tool Co. ....	Toolholders—New catalog S-48 describes a line of toolholders for lathes, planers, slotters and shapers. (Page 155)
A-3-273	The Atrax Co. ....	Solid Carbide Tool Bits—Catalog describes the various shapes and applications of carbide tool bits. (Page 273)
A-3-191	The Baird Machine Co. ....	Multiple Transfer Press—Bulletin describes operating features and construction of transfer presses. (Page 191)
A-3-185	Bay State Abrasive Products Co. ....	Diamond Grinding Wheels—New diamond wheel catalog discusses construction and advantages of diamond wheels. (Page 185)
A-3-236	Brown & Sharpe Mfg. Co. ....	Milling Machine Components—New catalog 35C describes arbors, adapters, and collets. Also discussed are cost-cutting features of milling cutters. (Page 235-236)
A-3-258-3	Commander Mfg. Co. ....	Multi-Drill—New catalog 851 gives full line and complete details of adjustable multi-drills. (Page 258)
A-3-204-1	The Cro-Plate Co. ....	Cleaning and Deburring Machines—8-page fully illustrated booklet discusses pressure blast applications for mold polishing, blending grind lines, deburring, heat treat scale removal, and honing of cutting tools. (Page 204)
A-3-136	Detroit Stamping Co. ....	Toggle Clamps—36-page catalog describes over 45 models of toggle clamps. (Page 136)
A-3-175	Detroit Tap & Tool Co. ....	Taps—Catalog-bulletin ST-53 discusses specific applications for tapping various types of material. (Page 175)
A-3-183	DeVlieg Microbore Co. ....	Boring Heads and Attachments—Catalog illustrates and discusses standard boring bar sets for mill and turret lathes for precision boring, turning, and facing operations. (Page 183)
A-3-124	H. E. Dickerman Mfg. Co. ....	Automatic Press Feeds—Literature and catalogs contain information on equipment, press feeds, press time, and production rates possible with automatic feeding. (Page 124)
A-3-187	Drill Unit Div. Rockwell Mfg. Co. ....	Air-Hydraulic Drill Units—Latest catalog describes cost savings and production possible with automatic drill units. (Page 187)
A-3-145	Eitco Tool Co., Inc. ....	Tapping Machines—Combination workholder, tapping head, and tapping machine designed into one unit is described in bulletin 72A. (Page 145)
A-3-281	Ex-Cell-O Corp. ....	Tool Grinders—Complete information concerning tool grinders is available in bulletin 46337. (Page 281)
A-3-257	Firth Sterling, Inc. ....	Tool and Die Steels—Full technical details concerning the various types of tool steels are available in bulletins. (Page 257)
A-3-4	Gisholt Machine Co. ....	Automatic Turret Lathes—Booklet "Wear and Surface Finish" and complete textbook tell of advantages of general-purpose superfinisher. (Page 4)
A-3-212-1	The J. C. Glenzer Co., Inc. ....	Floating Toolholders—Data File J tells how to economize and maintain close tolerances with floating toolholders. (Page 212)
A-3-258	Hapman Conveyors, Inc. ....	Conveyors—Bulletin TE-354 describes 3 types of installations for metal chip and dust removal. (Page 258)
A-3-242-2	John Hassall, Inc. ....	Decimal Equivalent Charts—Three color chart is prepared by Hassall cold heading parts manufacturer. (Page 242)
A-3-182-1	Ideal Industries, Inc. ....	Live Centers—Catalog points out construction features and advantages of "Universal" live centers. (Page 182)
A-3-251	The Ingersoll Milling Machine Co. ....	Slot Cutters—Catalog 60F describes carbide inserted blade face mills, end mills, helical slab mills, side mills, arbor cutters, angular cutters, and boring heads. (Page 251)
A-3-196	Jones & Lamson Machine Co. ....	Die Heads—Die heads and chasers are discussed and illustrated in catalog. (Page 196)

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A-3-34	Kling Bros. Engineering Works .....	<b>Stock Shears</b> —Double angle shears and economies resulting from their use are discussed in bulletin 2345. (Page 34)
A-3-221	Lodding, Inc. ....	<b>Fixture Components</b> —Includes full-scale layouts of every Lodding fixture. (Page 221)
A-3-253	M. B. I. Export & Import Ltd. ....	<b>Combination Machine</b> —Illustrated brochure 103 describes a combination boring mill and jig borer with optical microscopes. (Page 253)
A-3-224	Metal Carbides Corp. ....	<b>Tungsten Carbide Blades</b> —New 84-page catalog 54-G discusses the sizes and shapes and applications of Talide-tipped blades. (Page 224)
A-3-212-2	W. F. Meyers Co., Inc. ....	<b>Drill Bushings</b> —Catalog 13 gives complete information and prices of carbide inserted bushings. (Page 212)
A-3-178	Miller Fluid Power Co. ....	<b>Air and Hydraulic Cylinders</b> —Bulletins A-105 and H-104 point out automation possibilities with air and hydraulic cylinders. (Page 178)
A-3-249	A. Milne & Co. ....	<b>Tubular Die Steels</b> —Complete line of tool steels and wide range of grades and sizes is presented in new "Hollow Die Catalog." (Page 249)
A-3-17	The Monarch Machine Tool Co. ....	<b>Turning Machines</b> —Brochure 1124 completely describes the Series 61 lathe. (Page 17-20)
A-3-32	Norton Co. ....	<b>Tumbling Abrasives</b> —New edition of 55-page booklet describes "Touch of Gold" abrasives for barrel-finishing. (Page 32)
A-3-171	Oakite Products, Inc. ....	<b>Metal Cleaning Detergents</b> —4-page booklet discusses cleaners, precleaners, and paint strippers. (Page 171)
A-3-184-4	J. A. Richards Co. ....	<b>Bend-Punch Machines</b> —Illustrated folder TE-5 tells how "Big Brother Bender" can save die cost and expensive presses. (Page 184)
A-3-190-2	Ring Punch & Die Co. ....	<b>Punches and Button Dies</b> —Data sheets cover specifications and prices and name area distributors for Carbon Vanadium punches and button dies. (Page 190)
A-3-230	The Sidney Machine Tool Co. ....	<b>Lathes</b> —Bulletin gives advantages and case histories of conventional and fluid tracer lathes. (Page 230)
A-3-16	Standard Pressed Steel Co. ....	<b>Socket Head Screws</b> —"Unbrako Standards" gives complete listings of socket screw products stocked by local distributors. (Page 16)
A-3-9	The L. S. Starrett Co. ....	<b>Micrometers</b> —Catalog 26A contains a new tool section plus 300-page display of Starrett line of precision tools and related equipment. (Page 9)
A-3-184-3	P. A. Sturtevant Co. ....	<b>Torque Wrenches</b> —"Sturtevant Torque Manual" supplies data for torque wrenches. (Page 184)
A-3-215	Sundstrand Machine Tool Co. ....	<b>Milling Machines</b> —Bulletin 741, "Engineered Milling Production," gives milling methods to provide short cut and profitable solution to milling jobs. Tooling diagrams and machine designs are both included. (Page 214-215)
A-3-137	Super Tool Co. ....	<b>Carbide Reamers</b> —"Standard Carbide Reamer Circular" No. 542 gives complete data and net prices for special reamers. (Page 137)
A-3-233	The Taft-Peirce Mfg. Co. ....	<b>Thread Gages</b> —Complete story of thread plugs, rings and snaps, special gages, and other thread measuring instruments is discussed in the Taft-Peirce Handbook. (Page 233)
A-3-158	The Tomkins-Johnson Co. ....	<b>Interchangeable-Head Reamers</b> —Catalog 153 points out how replacement costs can be cut by using reamers with detachable cutting heads. (Page 156)
A-3-31	Vascoloy-Ramet Corp. ....	<b>Toolholders</b> —Detachable carbide insert toolholders are fully described in catalog V-R 435. (Page 30-31)
A-3-247	Waldes-Kohinoor, Inc. ....	<b>Grooving Tools</b> —20-page manual contains full information on Waldes Truarc grooving tools. (Page 247)
A-3-198	Wales-Strippit Corp. ....	<b>Hole Punching and Notching Units</b> —Catalogs BL and N show in colored illustrations the advantages and construction features of various units. (Page 198)

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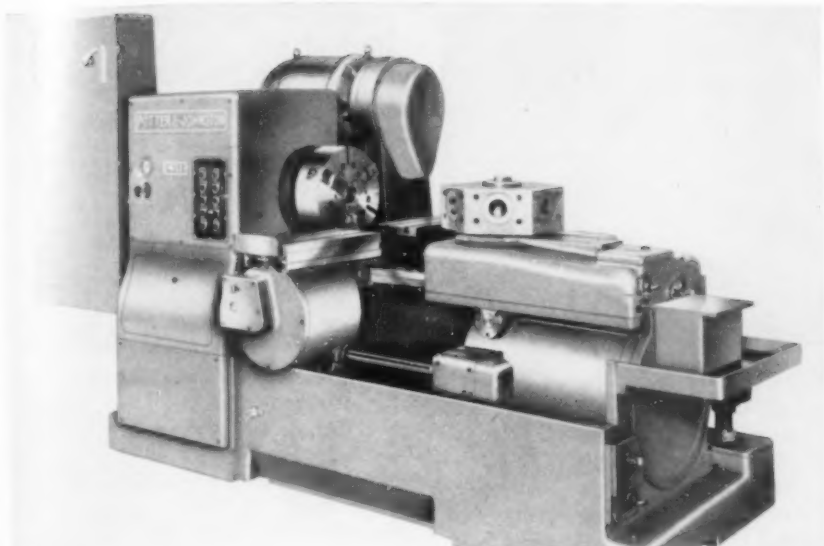
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## Automatic Turret Lathe

A high powered automatic turret lathe, designated the Model 4U, has been designed primarily for rapid removal of metal with modern carbide tools by Potter & Johnston Co. of Pawtucket, R. I.

Its 8 inch type A-1 American Standard spindle nose takes chuck sizes 10, 12, or 15 inches. Four automatic instantaneous speed changes are provided by powerful multi-disk friction clutches electropneumatically controlled by adjustable dogs on a dog drum. Through pick off gears, spindle speeds ranging from 45.5 to 1177 rpm can be obtained. A large magnetic clutch and brake, designed to give cushioned starting and stopping of the spindle, allows greater flexibility in operation. These features together with a 25 hp motor permits use of modern carbide tooling for fast metal removal on the toughest materials.

The large, accurately positioned, six-faced turret is indexed with a smooth acting geneva movement. A tapered seat clamping arrangement in the turret slide gives a rigid base for tooling. The turret slide has a travel of 12 inches, of which 8 inches is feed. In addition the slide is adjustable along the base ways giving greater tooling possibilities. The design of the turret allows coolant to be pumped either over head for turning tools or through the bars for boring and drilling.

Individually operated front and rear cross slides can be easily adjusted along the base ways. Six automatic feed changes permit an overall feed range of 0.002 inches to 0.163 inches per spindle revolution, to both cross slides and turret slide.

All machine functions, including automatic changes of speeds, feeds,

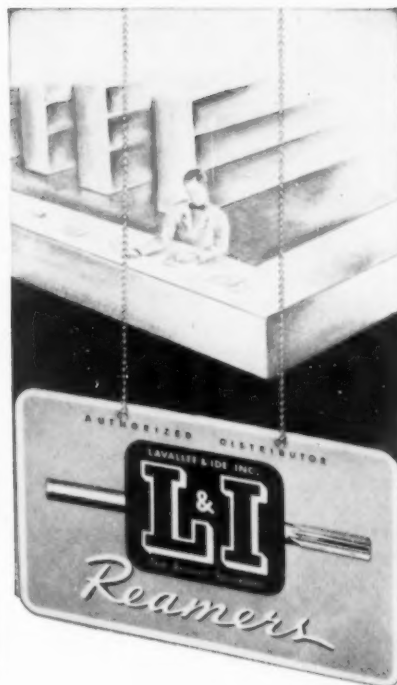
rapid traverse and automatic stopping of the machine are controlled from a conveniently located dog drum.

Design of the model 4U is such that the following attachments can be easily applied: slow spindle speed for drill head pickup; slow spindle speed for spindle positioning; and reversing spindle for right or left hand threading with automatic tap withdrawal. **T-3-1351**

## Gear Checker

A different type of gear checking machine, the Analytical Comparator, developed to provide a quick, accurate and low-cost analytical comparison check on production gears, is available from Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39, Ill.

Styled by the industrial design firm of Reinecke & Associates in collaboration with engineers of Illinois Tool Works, the machine is practical for both large and small volume gear producers. It offers a simplified and less expensive method of analysis than that



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Sign*

is your  
guarantee  
of top  
performance  
..in a reamer  
...in a  
distributor.



*The  
Reamer  
Specialists*

**LAVALLEE & IDE, INC.**

**CHICOPEE, MASS.**

INDICATE A-3-135

required by a complete analytical check with a separate involute, space and helical lead checking machines.

The permanent, easy to read graphic record provided by the unit reveals all variations between a master gear and the production gear being checked. Further, it shows the true condition of the inspected surface more definitely than does numerical data alone, since it tells where the errors originate.

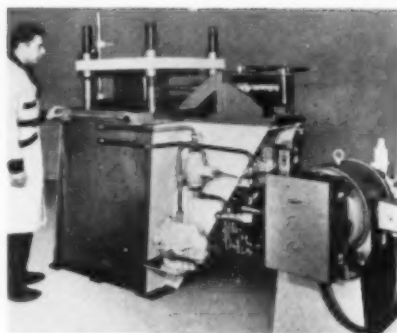
Principal feature of the machine lies in its combination of all essential gear checks. A table motion parallel to the axis of the gear checks the lead. A perpendicular motion checks involute or tooth profile, and the in-and-out motion of the indicator slide checks the spacing.

In keeping with the modern trend in industrial design, the machine emphasizes simplicity of form, ease of operation and maintenance. **T-3-1361**

### Inverted Presses

A line of inverted vertical hydraulic presses adaptable to a wide variety of stamping and extrusion operations has been developed by Walter P. Hill, Inc., 22183 Telegraph Rd., Detroit, Mich.

An unusual design feature which locates the hydraulic control cylinder in the base of the machine reduces



overall height, avoids shut height limitations, lowers center of gravity and provides areas at the top and sides for the mounting of auxiliary hydraulic cylinders.

Inverted presses are particularly adapted to bending and extrusion operations on ferrous and nonferrous parts as well as upsetting, drawing and coining operations that would require special auxiliary equipment on standard presses. Stampings requiring deep draws and additional auxiliary operations also can be produced simply on these presses. Multiple operations such as piercing or deforming can be performed during the deep drawing or extrusion operations.

Die capacity of the presses can be easily increased by providing long

guide rods. Large press bed areas avoid the necessity of installing auxiliary die guide equipment to obtain perfect die register.

The machine itself has a cylinder, operating on 5,000 psi pressure supplied by a five-to-one hydraulic booster, has its piston rod in a vertical position extending downward toward the base of the press. This cylinder imparts vertical motion to the upper die platen through four widely spaced rods, guided in individual bronze bushings in the press table.

Vertical die travel is limited only by the stroke of the cylinder. Variable shut height adjustments are made by turning spanner nuts on the threaded ends of the four actuating guide rods.

Auxiliary hydraulic cylinders for controlling extrusion, forming or drawing operations can be mounted on top of the platen or on plates with fabricated bases on any of three sides of the die.

On the Hill inverted hydraulic press illustrated, individual straight pieces of metal tubing are placed in the lower die and dual pushbutton cycle controls are actuated by the operator. The press then goes through this automatic operating cycle: dies close, the auxiliary cylinder, or cylinders, at various locations on the machine extrude the tube to the desired form, and the dies open. The finished elbow is removed and the machine is ready to produce another part.

Release of pressure on either or both pushbutton controls during the cycle before die closure causes the upper die to immediately retract to upper position where it remains until the buttons are both simultaneously depressed. This feature provides maximum operator safety. **T-3-1362**

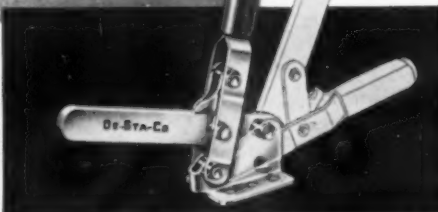
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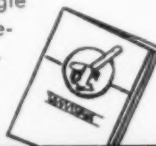


**TOGGLE CLAMPS**



This is new—Destaco's new clamp design which gives you hardened bushings in all series 210, 220, 228 and 240 toggle clamps. The new bushings run full length through the clamp bars for a larger bearing surface—and they're deeply serrated to lock in position with no chance of turning in the bars. You get a minimum of wear, smooth, accurate snap action, even under tough production conditions. A feature of our heavier series for some years, this development sets new standards for tooling requiring 500 to 800 lbs. pressures. Further improvements have been incorporated in the "wrap around" construction which strengthens the base.

For any fast clamping action in milling, drilling, welding, bonding, molding, riveting or bolted assembly operations—specify Destaco Toggle Clamps for pressures up to 4000 lbs. Consult our stocking representatives in your area, or select from our 36-page catalog describing over 45 models. Write for his name and your copy today.



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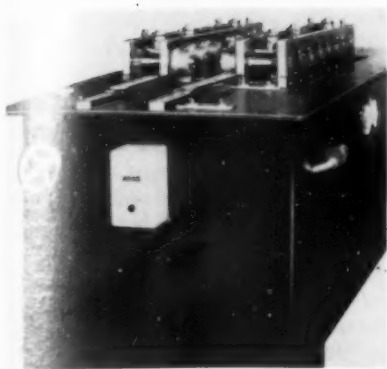
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### Rolling Machine

Both sides or edges of material are formed simultaneously on the dual-head rolling machine introduced by The Flagler Corp., 19321 Filer Ave., Detroit 34, Mich. The unit handles material from 3 inch strips up to 36 inch wide sheets in a variety of gages. Identical or different forming rolls can be used on the two forming heads. Material comes out perfectly parallel, regardless of camber or deviation in shearing.

These machines are designed to be particularly suitable for metal rolling jobs in which the edges are to be



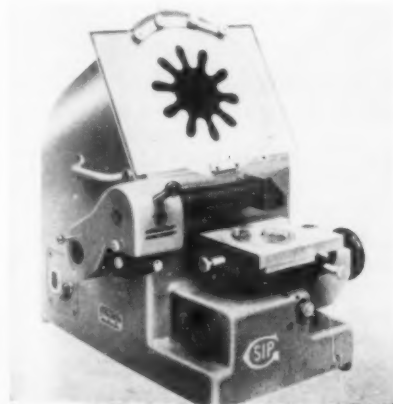
flanged or otherwise formed.

By merely loosening the locking mechanism and turning the hand wheel (power traverse optional) the forming heads move apart or close in. Feed gages do not have to be reset, as they move with the forming head. In operation, speeds up to 125 fpm are attainable, providing 250 ft of completed flanges or seams per minute.

As to construction, spindles on the unit are hardened and ground, and gears are cased hardened, while Torrington needle bearings are used throughout. The table is reinforced underneath against deflection. All controls are within easy reach. **T-3-1371**

### Portable Profile Projector

A profile projector designed to extend the field of application of the optical control to all stages of the manufacturing process has been presented by the Societe Genevoise d'Instruments de Physique. Known as Type AP-17, the unit is of relatively small size and light weight which can be easily transported wherever it is required. It serves both for gaging the silhouette in transmitted light (diascopic illumination) and for inspecting the surface of a piece by means of incident light (episcopic illumination). Both kinds of illumination are derived from a single lantern and can be com-



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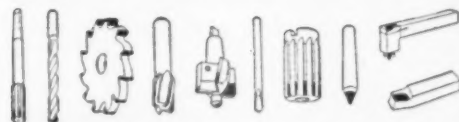


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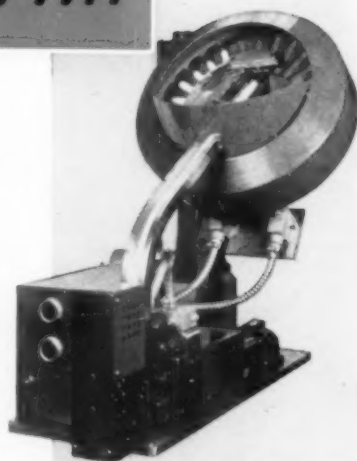
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PROVIDE ASSEMBLY SPEED  
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quickly how these advanced machines can be adapted to your requirements . . . Send samples now for detailed information.

**DETROIT POWER SCREWDRIVER CO.**

2799-A W. FORT ST.

DETROIT 16, MICH.

bined for simultaneous examination of the contour and surface.

The screen, of circular form, has a diameter of  $7\frac{7}{8}$  in. It is rotatable and provided with a graduation in degrees, while a vernier permits angular readings to 5 minutes of arc.

Three magnification ratios (10x, 20x and 50x) are available and guaranteed accurate to 0.001 for diascopic illumination and to 0.0005 of their nominal value for episcopic illumination. Direct measurements can be made on the screen by means of a precision glass scale.

Observation is simple. Arrangement of the object table and of the screen eliminates continuous changes in visual adjustment. There is no interfering shadow, neither from the operator's hand nor from the instruments used.

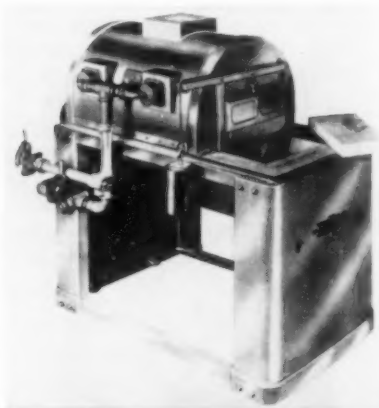
Further information is available from American SIP Corp., 100 E. 42nd St. New York 17, N. Y. T-3-1381

## Reverberatory Furnaces

Small reverberatory furnaces for aluminum, brass and magnesium, additions to the line of small die casting machines, have been announced by D.C.M.T. Sales Corp., 164 Duane St. New York 13, N. Y.

These units, known as the DCMT AR/200 and the DCMT AR/500, have capacities of 200 and 500 lb of aluminum respectively.

Main advantages offered by the units are that they overcome what are considered two basic drawbacks of re-



verberatory furnaces: they require minimum floor space and give furnace atmosphere control.

At the same time, they effect considerable saving in gas consumption over a crucible type furnace, since no heat is lost through radiation from the open surface of the metal, and also because flame in a reverberatory furnace is directed on the metal itself.

rather than heating a pot which in turn heats the metal.

The entire furnace comes as a package with blower or compressor mounted directly under the furnace. All air, gas and electrical controls are mounted conveniently at the side of the housing.

Control of the amount of heat is accomplished simply by varying the air control valve to the combustion chamber. This in no way affects the atmosphere in the furnace, which is pre-set upon installation via a flue gas analysis.

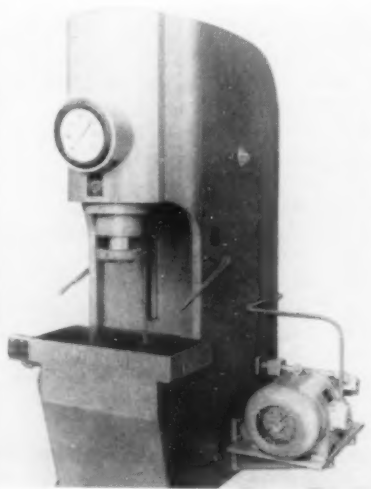
Under ordinary use, the units will function for at least eighteen months before rebricking is necessary.

**T-3-1391**

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## Straightening Press

Manufacture of a vertical hydraulic straightening press with rapid advance, power pressing, and rapid return stroke has been made public by American Broach and Machine Co., a division of Sundstrand Machine Tool Co., Ann Arbor, Mich. Available in 75, 100 and 150-ton capacities, the machine can be



supplied with a large dial-type pressure gage and remote control adjustment for relief valve setting.

The hydraulic circuit includes two separate pumping units, both of which are used for the rapid advance and return stroke. Only one of the units is used to develop the maximum pressure used for the power pressing stroke. A decompression valve in the hydraulic circuit automatically prevents high pressure shock when the machine ram stroke is reversed.

**T-3-1392**



*Push or Pull*

... and no matter which way you operate your broaching machine ... it is still the broach that does the cutting.

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March, 1954

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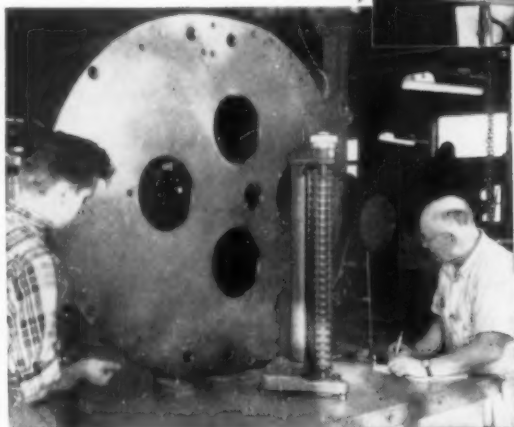
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Single jig boring projects such as this jet aircraft fixture.

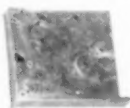
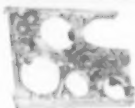


Jig boring a master fixture section for jet aircraft. Bushings were fitted to multiple holes with tolerances accurate to .0005".



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## Who's Meeting - and Where

**Mar. 4-5.** AMERICAN SOCIETY FOR METALS. Spring meeting, Hotel Statler, Boston. For more facts write to society headquarters, 7301 Euclid Ave., Cleveland, Ohio.

**Mar. 16-17.** STEEL FOUNDERS' SOCIETY OF AMERICA. Annual meeting, Edgewater Beach Hotel, Chicago. Society office, 920 Midland Bldg., Cleveland 15, Ohio, can supply more facts.

**Mar. 8-10.** AMERICAN INSTITUTE OF CHEMICAL ENGINEERS. National meeting, Statler Hotel, Washington, D. C. Get more details from society office, 1155 Sixteenth St., N.W., Washington 5, D. C.

**Mar. 10-12.** AMERICAN SOCIETY OF MECHANICAL ENGINEERS. International meeting, Mexico City, D.F., Mexico. Contact society office, 29 W. 39th St., New York, N. Y. for more information.

**Mar. 15-19.** NATIONAL ASSOCIATION OF CORROSION ENGINEERS. Annual conference and exhibition, Municipal Auditorium, Kansas City, Mo. Write for details to 1061 M & M Bldg., Houston 2, Texas.

**Mar. 17-19.** PRESSED METAL INSTITUTE. Technical meeting and exhibition, Hotel Carter, Cleveland. Address institute headquarters, 2960 E. 130th St., Cleveland, Ohio, for complete information.

**Mar. 19-20.** MACHINERY & ALLIED PRODUCTS INSTITUTE. Fourth session, seventh conference on capital goods economics. The Greenbrier, White Sulphur Springs, W. Va. For complete information, write 1200 18th St. N.W., Washington 6, D. C.

**Mar. 22-26.** NATIONAL ASSOCIATION OF POWER ENGINEERS, INC. National convention, Hotel Sherman, Chicago. More details may be had from association offices, 176 W. Adams St., Chicago 3, Ill.

**Mar. 24-Apr. 1.** AMERICAN CHEMICAL SOCIETY. Spring meeting, Kansas City, Mo. Contact society headquarters, 1155 Sixteenth St., N.W., Washington 6, D. C., for all details.

**The Tool Engineer**

Mar. 29-31. SOCIETY OF AUTOMOTIVE ENGINEERS. National Production meeting and forum, Drake Hotel, Chicago, Ill. Society office, 29 W. 39th St., New York 18, N. Y., can supply more facts.

Mar. 31-Apr. 1. AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Management conference, Benjamin Franklin Hotel, Philadelphia. Write for more facts to society offices, 29 W. 39th St., New York, N. Y.

Apr. 2-3. THE RICE INSTITUTE. Biennial Rice Exposition of Engineering, Science and Arts (formerly The Rice Review and The Rice Institute Engineering Show), Campus of Rice Institute, Houston, Texas. Direct inquiries to Harold Lacy, Publicity Manager, P.O. Box 1892, Houston, Texas.

Apr. 3-4. PACKAGING MACHINERY MANUFACTURERS INSTITUTE Spring meeting, Hotel Dennis, Atlantic City, N. J. Write to institute office, 342 Madison Ave., N. Y. for facts.

Apr. 5-6. SOCIETY OF THE PLASTICS INDUSTRY (CANADA), INC. Twelfth annual conference, Mount Royal Hotel, Montreal, Quebec, Canada. Society headquarters, 67 W. 44th St., New York 36, N. Y., can give details.

Apr. 5-7. AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS. Open hearth conference, and blast furnace, coke oven and raw material conference, Palmer House, Chicago. Contact institute office, 29 W. 39th St., New York 18, N. Y. for details.

Apr. 5-7. NATIONAL FLUID POWER ASSOCIATION. Spring meeting, Edgewater Gulf Hotel, Edgewater Park, Miss. For more facts, write association headquarters, 1618 Orrington Ave., Evanston, Ill.

Apr. 5-7. METAL TREATING INSTITUTE. Spring meeting, The Homestead, Hot Springs, Va. Address institute office, 271 North Ave., New Rochelle, N. Y. for details.

Apr. 6-7. WESTINGHOUSE ELECTRIC CORP. Sponsor for Machine Tool Electrification Forum. Hotel Statler and Westinghouse works, Buffalo, N. Y. For details, write A. G. Muller, Westinghouse, East Pittsburgh plant.

Apr. 12-15. SOCIETY OF AUTOMOTIVE ENGINEERS. National Aeronautical meeting, Statler Hotel, New York City. Send for more information to society office, 29 W. 39th St., New York 18, N. Y.

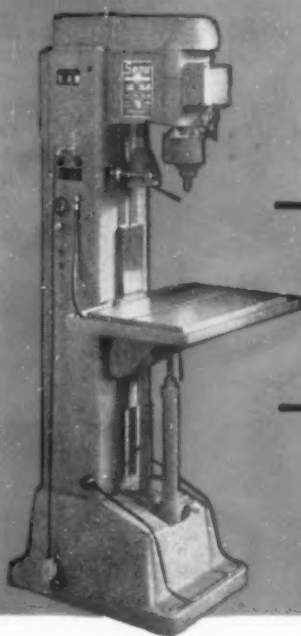
Apr. 14-16. SOCIETY FOR EXPERIMENTAL STRESS ANALYSIS. Spring meeting and exhibit, Hotel Netherland-

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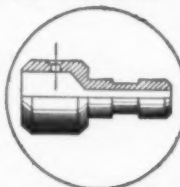
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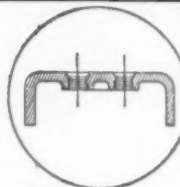
### DRILLING

Crossdrill and C" T" Sink 1/16" Hole  
Material—Brass  
Production—4800 per hour  
Fixture—#15 Vertical index  
Equipment—#1-UD Drilling  
Machine



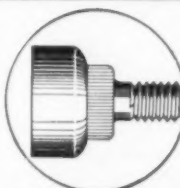
### TAPPING

Tap Two #10-32 Holes  
Material—Steel stamping  
Production—3800 tapped holes  
per hour  
Fixture—#14 horizontal index  
Equipment—#1-UT tapping  
machine



### THREADING

3/8"—24 Thread—1/2" Long  
Material—Die Cast Aluminum  
Production—2500 per hour  
Fixture—#10 Drum dial  
Equipment—#3-TR Threading  
machine



Snow air operated—electrically controlled machines have built in full universal controls that allow selection of the type of spindle cycle desired. This feature also permits instant synchronization of the standard Snow Master Fixtures. All types of air operated automatic and semi-automatic jigs and fixtures are carried in stock. Standardization permits low cost tooling—and—high production.

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Plaza, Cincinnati, Ohio. Other details are available from society office, P. O. Box 168, Cambridge 39, Mass.

**Apr. 19-20.** STANFORD RESEARCH INSTITUTE. Joint sponsors with the United States Air Force of Symposium on "Automatic Production of Electronic Equipment," Fairmont Hotel, San Francisco. Write to general chairman, L. K. Lee, head of Advanced Techniques Group, Engineering Div., Stanford Research Institute, Stanford, Calif., for complete information.

**Apr. 20-21.** AMERICAN ZINC INSTITUTE, INC. Annual meeting, Hotel Statler, St. Louis, Mo. More information may be obtained from the institute office, 60 E. 42nd St., New York 17, N.Y.

**Apr. 21-24.** NATIONAL SCREW MACHINE PRODUCTS ASSOCIATION. Annual meeting, Hotel Statler, Detroit. Write association office, 2860 E. 130th St., Cleveland 20, Ohio, for complete facts.

**Apr. 22-23.** AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Conference on Feedback control, Claridge Hotel, Atlantic City, N. J. Institute office, 33 W. 39th St., New York 18, N. Y. can supply data.

**Apr. 23-24.** MACHINERY & ALLIED PRODUCTS INSTITUTE. Fifth session, seventh conference on capital goods economics. The Homestead, Hot Springs, Va. Write for details to institute office, 1200 18th St., N.W., Washington 6, D. C.

**Apr. 26-28.** METAL POWDER ASSOCIATION. Tenth annual meeting, Drake Hotel, Chicago. Get more information from association office, 420 Lexington Ave., New York 17, N. Y.

**Apr. 26-30.** AMERICAN SOCIETY OF TOOL ENGINEERS. Tool Engineers' Industrial Exposition, Convention Hall, Philadelphia, Pa., to be held concurrently with annual meeting, Benjamin Franklin and Bellevue Stratford Hotels.

**Apr. 29-30.** SOCIETY FOR THE ADVANCEMENT OF MANAGEMENT. Time study and methods conference, Statler Hotel, New York City. Complete facts available from society headquarters, 84 William St., New York, N. Y.

**May 2-6.** ELECTROCHEMICAL SOCIETY INC. Annual spring meeting, LaSalle Hotel, Chicago. Contact society headquarters, 216 W. 102nd St., New York 25, N. Y. for details.

**May 3.** CLEVELAND ENGINEERING SOCIETY, Invention Conference Group. Sponsor of Invention Exhibit and Conference. Contact the society, 2136 E. 19th St., Cleveland 15, Ohio, for full particulars.

**May 3-5.** ASSOCIATION OF IRON & STEEL ENGINEERS. Spring conference, Bellevue-Stratford Hotel, Philadelphia. More data may be had from association office, 1010 Empire Bldg., Pittsburgh 22, Pa.

**May 3-14.** BRITISH INDUSTRIES FAIR. Annual industrial show, London and Birmingham, England. Complete information may be had from any British Consulate office in the United States, or from the British Information Office, 30 Rockefeller Plaza, New York, N. Y.

**May 4-7.** AMERICAN WELDING SOCIETY. National spring technical meeting, Hotel Statler, Buffalo, N. Y. to be held concurrently with second Welding & Allied Industrial Exposition, May 5-7, Memorial Auditorium. Contact society office, 33 W. 39th St., New York, N. Y. for more information.

**May 8-14.** AMERICAN FOUNDRYMEN'S SOCIETY. Annual convention and biennial exposition, Public Auditorium, Cleveland. Write society office for data: 616 S. Michigan Ave., Chicago 5, Ill.

**May 17-20.** BASIC MATERIALS EXPOSITION. International Amphitheatre, Chicago. Producers of the event, Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y., can supply details.

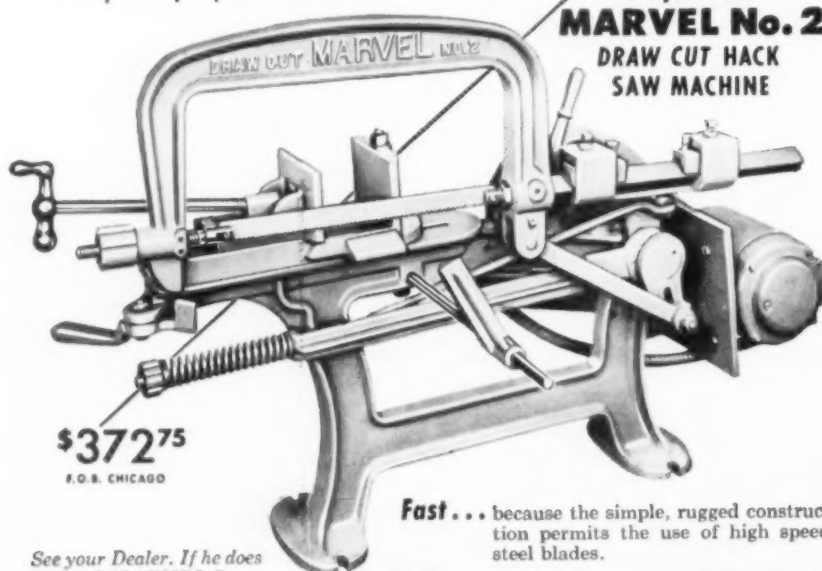
**Sept. 14-23.** FOURTH EUROPEAN MACHINE TOOL EXHIBITION, Milan, Italy. For all details concerning the show, write to Mr. E. Vandone, Manager, Unione Contruttori Italiani Macchine Utensili, Via Gaetano Giardino, 4, Milan, Italy.

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# Electronic Drives

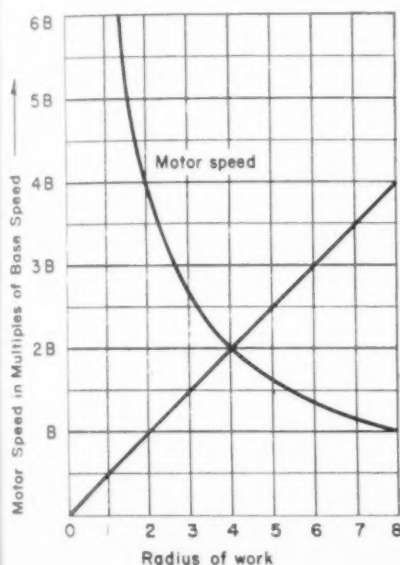
*Speed production in many new machine tool applications and a variety of other uses.*

by F. E. McLane

Industrial Electronic Control  
Engineering

Westinghouse Electric Corp.

## Technical Digests



Marked improvements in electronic drives have occurred in recent years. As a natural outgrowth of these improvements, there have been numerous interesting and useful applications of these drives to machine tools.

Since machine tool drives vary from extremely simple unregulated drives to complex systems involving several regulating loops, no attempt is made to give detailed consideration to all such drives. As a substitute for general coverage, several drives for machine tools are considered of interest due to application, performance, or design.

The AV drive with counter emf regulator and reactor control of speed can

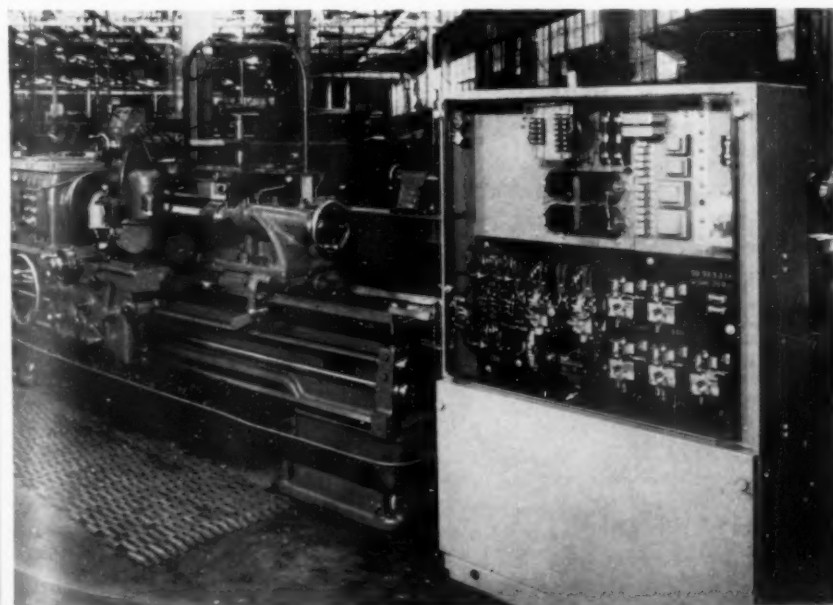
←Fig. 1. Drive speed vs. work radius. Area under straight line is proportional to metal removed and time required for removal.

be applied to lathes in order to hold the cutting speed constant at the tip of the tool. When a facing cut is made in which the tool moves inward to the center of the work, the rotational speed of the work must be increased in order to hold the cutting speed constant. Fig. 1 shows the relation between tool position and spindle speed, which is necessary in order to obtain constant cutting speed.

The tool feed is usually a mechanical drive directly geared to the spindle. Under these conditions the feed (expressed as inches per revolution of the spindle) is held constant for one gear ratio. This means that the feed rate in inches per second is a variable and increases rapidly as the tool tip moves toward the center of the work because the spindle speed is increased in order to hold the cutting speed constant. The resulting characteristic performance shown in Fig. 1 should be appreciated by all tool engineers, since it has important bearing on the cost of the spindle drive.

Both the amount of metal removed and the time required to remove it decreases as the radius decreases. Since the cost of the electric drive increases rapidly as the speed range is increased over which the drive is to deliver constant hp, a "cross-over" point is soon reached where the decrease in machining time obtained by extending the spindle speed range is insufficient to make it practical to apply a more costly drive.

Fig. 2 is a photograph of a 25 hp AV drive connected to a lathe used to turn shafts. A single motion duplicator is attached to the compound tool rest. The longitudinal feed is geared from the spindle and the spindle speed is determined by the radial position of the tool. As the tool moves inward, a small cam



←Fig. 2. Special spindle drive operating with single motion duplicator on shaft turning lathe.

## Technical Digests . . .

changes the position of a plunger in the small movable core reactor attached to the rest. The cam is shaped to move the reactor plunger in a suitable manner to obtain constant cutting speed at the tool tip.

The welding positioner complete with a fractional hp drive is shown in Fig. 3. In this application it is essential that the table rotation speed be held constant independent of changing load due to eccentric loading. Any change in table speed will result in a change in the amount of welding material deposited.



Fig. 3. Welding positioner with fractional hp drive.

This drive is of interest because it has been modified recently to provide much better regulation by means of a more sophisticated compensation for linear variables due to load or speed. The schematic for this modified drive is shown in Fig. 4. The improvement in regulation is achieved by means of a potentiometer IAP which increases the effective IR compensation signal as speed is increased.

Feed drives for machine tools are of a variety of types ranging from drives with narrow speed ranges and no particular abilities regarding speed regula-

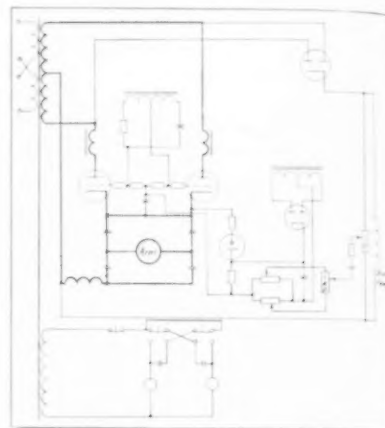


Fig. 4. Circuit diagram of fractional hp drive with special compensation.

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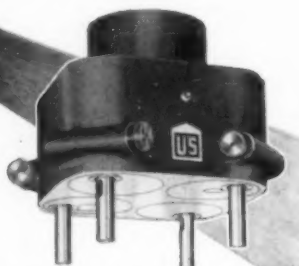
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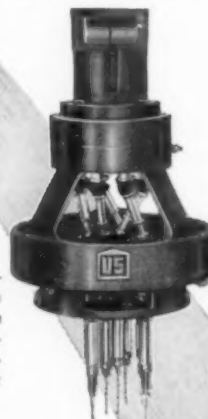


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Single eccentric type for equally spaced holes on bolt circles.



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tion, to drives with very special regulating circuits and correspondingly outstanding performance.

The special feed drive shown in Fig. 5 is an interesting example of one with special characteristics. This recent design has been created to fill the need for wide range feed drives on bar machines and planer-millers. The speed of the motor operated by this special drive can be adjusted to any value between  $7\frac{1}{2}$  and 1800 rpm. The speed regulation at  $7\frac{1}{2}$  rpm is essentially flat and the regulation at top speed is 5 percent or less.

To obtain satisfactory performance of the drive at low speeds is, therefore, one of the difficult problems. These drives are satisfactory when operating at  $7\frac{1}{2}$  rpm only because there are no sudden torque changes applied to the drive motor armature. The most sudden load changes occur on the bar machine, where clutches can be operated to initiate motion of the column while the feed drive has previously been moving only the bar.

Fast circuit response is also required for "inching" in order to locate the bar and column accurately and quickly. Due to the torsion of the gearing in such a machine tool, it is necessary that the drive deliver a sudden torque or "shock" to the gearing in order to be able to move the column by a small amount. A

**The Tool Engineer**

## Technical Digests . . .

sustained torque gradually applied to the bearing will cause minimum movement of the column which will be large enough to make accurate positioning most difficult.

In addition to these electrical features this new drive has been made quite different mechanically. Reference to Fig. 5 will show that all components

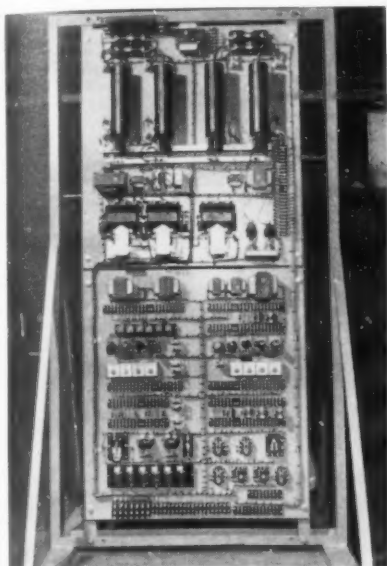


Fig. 5. Special wide speed range drive for bar machine.

are front mounted and front wired on two flat panels. The components are connected by screw terminals in order to simplify checking and replacement.

The mechanical and electrical features of these drives differ markedly, but they have a common denominator in that each drive uses electronic components and may be applied to perform its specific function as a feed drive or a table drive for a machine tool.

From a paper presented at Sixth Annual AIEE Machine Tool Conference, October, 1953.

## High Temperature Coatings

By B. L. Paris

Power Plant Laboratory  
Weights Air Development Center

The Air Force has, for the past several years, sponsored a high-temperature ceramic coating research and development program for practical utilization of such coatings on the hot gas components of aircraft power plants. The results of this program will, in many cases, be directly applicable to

various industrial high-temperature uses. Such coatings may be used to extend the life of relatively high alloys in applications such as reciprocating engine exhaust systems and high-temperature furnace components where failure is generally a result of oxidation, corrosion, and embrittlement. Low-alloy steels may be coated to replace the critical and expensive alloys currently being used in the hot gas sections of gas turbine power plants.

The position of the Air Force with regard to high temperature ceramic coatings can be summarized as follows:

Ceramic coatings can and will be successfully used in aircraft power

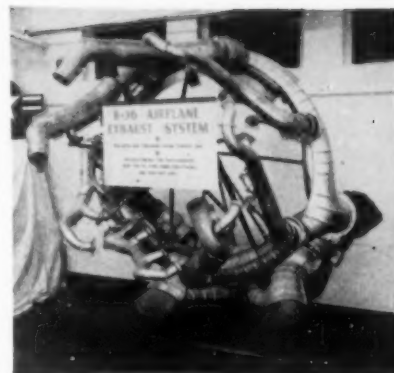


Fig. 1. Typical reciprocating engine exhaust system.

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## Technical Digests . . .

plants provided the designer takes into consideration the limitations as well as the inherent advantages that can be realized by their usage.

Ceramic coatings for aircraft applications which provide the base metal with adequate protection from oxidation



Fig. 2. Typical coated gas turbine liner.

and corrosion must also be resistant to failures by thermal and mechanical shock.

The service life of reciprocating engine exhaust systems can be substantially increased by the use of ceramic coatings since many metallurgical failures are thereby prevented, Fig. 1.

### Potential Industrial Applications for High-Temperature Ceramic Coatings

#### 1. Furnaces

- (1) High-temperature furnaces
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  - (b) Handling tools
  - (c) Furnace elements, etc.
  - (d) Oxygen probes
  - (e) Melting pots

- (2) Home furnaces
  - (a) Combustion chambers
- (3) Industrial boiler applications

#### 2. Oil refinery equipment

#### 3. Chemical industry equipment

#### 4. Automotive

- (1) Diesel and marine power plants
  - (a) Mufflers, tailpipes, etc.
- (2) Passenger cars
  - (a) Mufflers, tailpipes, etc.

#### 5. Commercial aircraft

- (1) Exhaust systems
- (2) Heat exchangers
- (3) Gas turbine engine components

#### 6. Hot areas on appliances

#### 7. Space heaters

#### 8. Temperature measuring instruments

## Technical Digests . . .

Experience has indicated that many of the high-temperature alloys can be replaced by ceramic coated low-alloy steels in the hot gas sections of gas turbine power plants, Fig. 2.

The use of high-temperature ceramic coatings by industry is a practical and economical step. Their utilization will undoubtedly lend impetus to broader developments and use for other military as well as commercial applications.

The hot gas components of the various aircraft power plants will be ceramic coated on a production basis in the near future. The coating industry will be required to furnish the necessary production know-how and facilities required to meet this challenge.

From a paper presented at the American Society of Testing Materials 1953 Annual Meeting.

## Automation in Weighing and Bulk Handling

by I. H. Richardson

Richardson Scale Co., Clifton, N. J.

Automatic scale applications require equipment that differs not only in capacity but according to the materials to be handled. So, bulk materials handling enters the picture. This can best be described by describing various batch-type automatic scales which differ because of the materials to be handled, the actual weighing operation being only incidental. The materials-handling com-

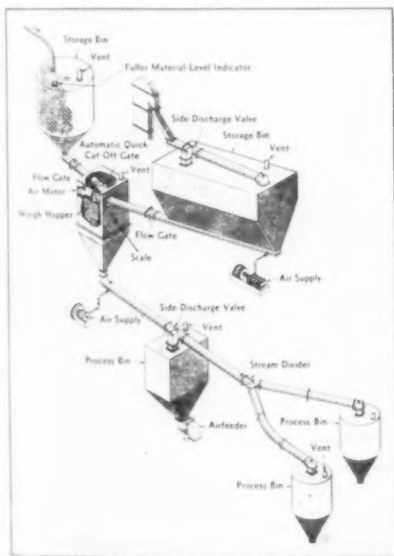


Fig. 1. Automatic weighing arrangement for finer materials.

March, 1954

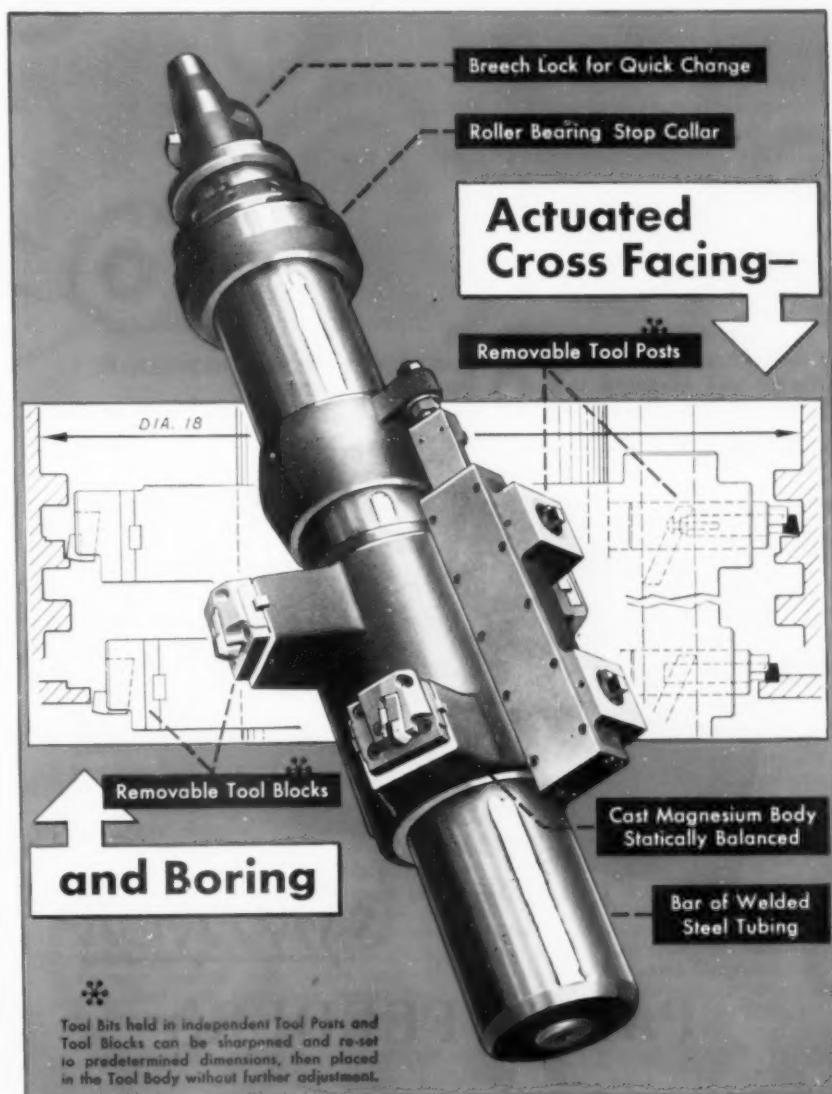
ponents basically must include a means of controlled feeding, a weighed receptacle or hopper with means for a controlled discharge.

The simplest of all automatic scales is the automatic grain scale because the materials handling is basically simple. A radial gate opens to a triggered lock under the pressure of counterweights; grain pours to the weight hopper until the beam balances and so trips the trigger to close the gate. This mechanical operation breaks the toggle to release the hinged hopper door, thereby discharging the weighed material. This principle is some 60 years old and is

still without equal for simplicity in weighing granular materials accurately to within 1 oz in 100 lb or 1/16th of 1 percent.

Materials vary from minus 300-mesh cement, and finer to 18 inch lumps of limestone. They may be sticky like dairy feed with 30 percent molasses, or fibrous like asbestos, or hot like cherry-red clinker, or abrasive, corrosive, toxic, explosive, and more recently, radioactive.

When materials are coarser and therefore less free-flowing, the gravity feed is replaced by the belt feeder, or the steel apron. When they are finer, feed-



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ing control is obtained by the multiple screw or vane feeder, or combination of the two, and more recently the air-slide feeder, Fig. 1.

The weigh hopper may have double doors for discharging sticky raw sugar or bulky asbestos; a motor-driven or air-operated radial discharge gate for releasing powdered materials. In differential weighing by loss of weight, the material is discharged by belt or vibrating feeder until a prescribed quantity remains in the scale system.

Almost any of these automatic scales can be equipped with a dial (pendulum or spring) for the purpose of providing indication, recording, and remote weighing selection. Similar results can be obtained by using the traveling poise, motor driven to seek automatically a balance position or a prescribed point along the steelyard, simple gearing thereafter driving the recorder or totalizer. The dial, however, is an accepted weighing medium, known and understood everywhere, and therefore has been used much more extensively in the development of automatic systems.

In the feed industry the Indiana mill of the Elkhart County Cooperative is so different and advanced in automation that it merits attention, Fig. 2.

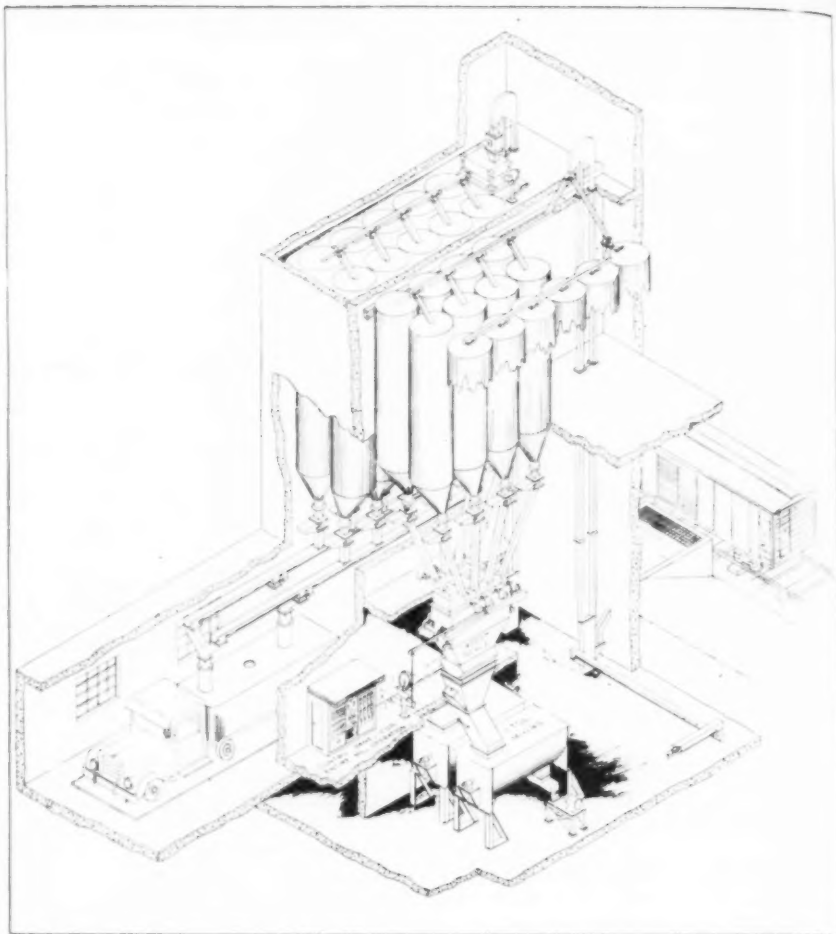
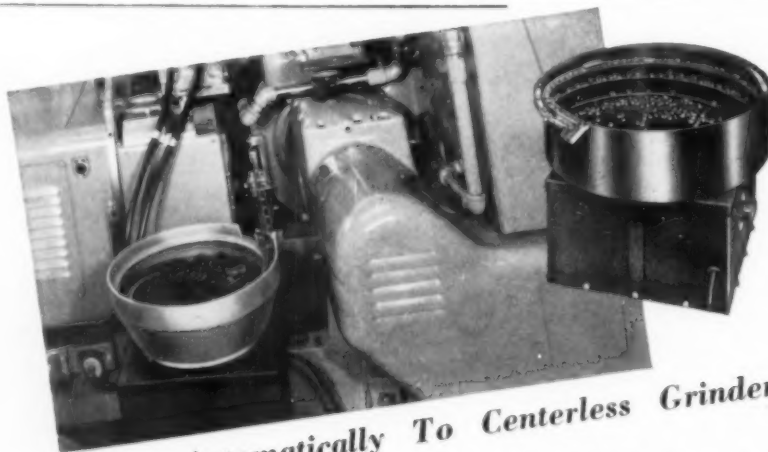
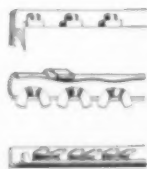


Fig. 2. Automatic proportioning system with remote mill control for one man operation in feed manufacture.



Slugs Fed Automatically To Centerless Grinder  
with **SYNTRON**

## PARTS FEEDERS



Small parts emerge from feeder trough in desired position, one at a time, at variable controlled speeds.

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**SYNTRON COMPANY**

340 Lexington Ave.

Homer City, Pa.

This mill is designed for bulk shipment only with a mixing capacity of 20 tons hourly. Formulas change constantly according to the demand of the bulk trucks at the loading station.

Labor is reduced to one man at the master control panel, a few maintenance men, and weighman for the outgoing trucks.

There are eight major ingredients in the hoppers above the batching scale, each being fed to the scale by its own screw-conveyor feeder.

The weighed batch is delivered by a diverter spout to either of two horizontal mixers, which in turn discharge to the conveying and elevating system going to the final storage bins ahead of the bulk trucks.

The left half contains of the control panel the remote controls for all the screw conveyors, bucket elevators, sifters, diverter spouts, and slide gates; the right side contains the means for remote selection of ingredients and formulation by weight, timers to sequence the mixing operation, and signal lights to indicate the progress of the cycle. A batch-stop counter determines the number of 2-ton batches to be

## Technical Digests . . . . .

discharged automatically to finished storage trucks, after which the system shuts down.

For the convenience of the operator in trouble-shooting, every motor in the machine has overload indication.

Progress in automation of weighing and bulk handling of materials is accelerated with each new system devised. Each installation represents an additional step in the science of bulk materials handling.

From a paper presented at the 1953 Semi-Annual Meeting of the American Society of Mechanical Engineers.



### Management for Automatic Production

by Charles E. Knight

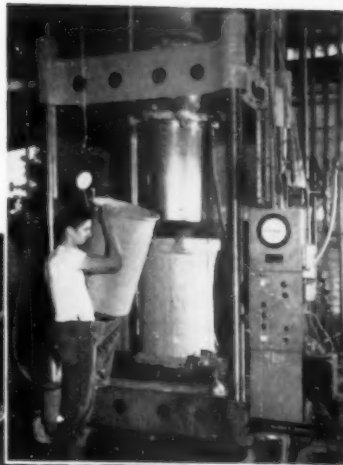
Monsanto Chemical Co.  
Springfield, Mass.

The true automatic factory may not be built for some time although steps are being taken presently in its direction. Before it is built the separate fields of business management, systems engineering, computer theory, and operations research must be united by those who can visualize an entire factory in terms of its final product family and can gather around them the necessary specialists who, working together, will create a structure of automation capable of complete end-point computer control.

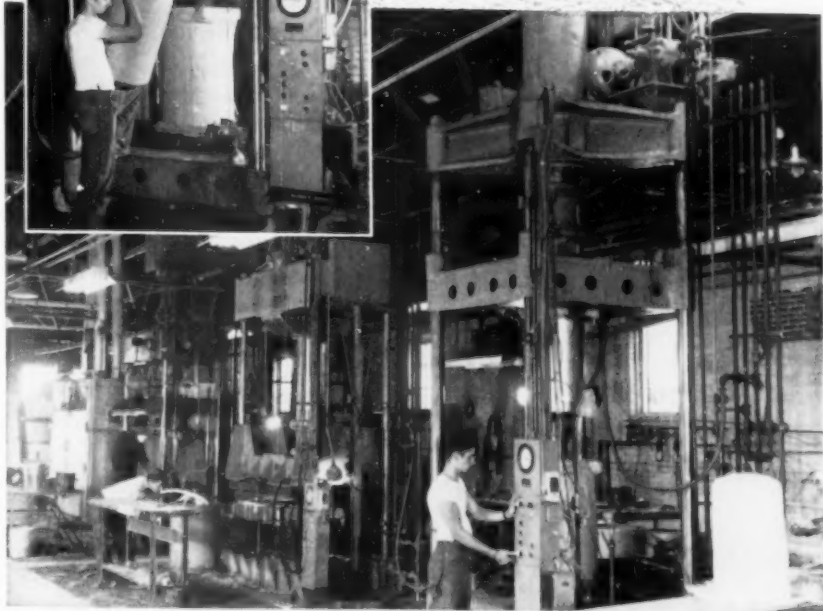
Management in automatic industry must be as streamlined and progressive as its environment. Concentration of new skills in fewer workers will require intelligent, versatile plant executives who can rub elbows with scientists and technicians and talk their language. This management organization will evolve from bringing specialists more and more into the line organization and developing in them the required characteristics of teamwork and perspective.

For some time the prevalent management form, even in highly mechanized plants, will be one of transition, combining features of conventional organizations with some of those suggested in this discussion. To a certain extent, in the normal progress of technological advancement, the adoption of automatic production is a certainty. A greater rate of progress will depend upon the degree of management's understanding and willingness to adapt itself to the needs of automatic production.

From a paper presented at the 1953 annual meeting of the ASME.



Finished mold for electronic housing being removed from 100-ton press.



Over-all view of 80-ton, 40-ton and 100-ton Farquhar Hydraulic Presses at American Insulator Corporation, New Freedom, Pa.

American Insulator reports:

## FARQUHAR HYDRAULIC PRESSES

give "closer tolerances and greater strength"\*

\*A battery of Farquhar Hydraulic Presses currently in operation at American Insulator Corp., New Freedom, Pa., was selected originally because the presses had to be custom-made, and Farquhar was in the best position to do this. In addition to this advantage, the Farquhar Presses have now proved to be more economical in operation and capable of maintaining closer tolerances due to greater rigidity of platens. So reports Mr. W. F. Remphrey, foreman of American Insulator's reinforced plastics division.

Three presses (40-, 80- and 100-ton) are used for molding fibre glass for production of classified electronic housings. The same job that formerly required an hour to mold through a vacuum process now takes only 6 minutes on a Farquhar Press! The hydraulic presses feature an automatic

cycle, with one-man loading.

#### Farquhar Presses Cut Your Costs

The above installation is just one more example of Farquhar performance in heavy production! Farquhar Presses are built-for-the job . . . assure faster production due to rapid advance and return of the ram . . . greater accuracy because of extra long guides on the moving platen . . . easy, smooth operation with finger-tip controls . . . longer life due to positive control of speed and pressure on the die . . . long, dependable service with minimum maintenance cost!

For a free catalog showing Farquhar Hydraulic Presses in all sizes and capacities for all types of industry, write to: THE OLIVER CORPORATION, A. B. Farquhar Division, Hydraulic Press Dept., 1519 Duke St., York, Pa.

# Farquhar

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# TRADE LITERATURE

For Free Booklets and Catalogs—  
Convenient Request Card on Page 133

## Alloy Wire, Rod, Strip

Handbook type information on Monel, nickel, Inconel and nickel clad copper wire, rod and strip to meet corrosion, heat and destructive service conditions contained in illustrated manual; covers various properties for each alloy, advantages, methods of producing and uses; includes charts, graphs and tables to assist in explanations. Alloy Metal Wire Co., Div. H. K. Porter Co., Inc., Prospect Park, Pa. **L-3-1**

## Castings and Magnetism

Data sheet "Magnetism in Cast Stainless Steel," concerned with magnetism in chromium and in chrome nickel stainless castings and wrought types. Covers such problems as Do magnetic tests measure corrosion resistance? Can magnetism vary in castings of similar compositions? What influences corrosion rates? and other questions. Empire Steel Castings, Inc., Reading, Pa. **L-3-2**

## Machining

Bulletin No. 66a, "The Machining of Ampco Metal," presents data resulting from experience and research relating to proper methods for machining of various grades of Ampco metal; well illustrated with drawings, tables and photographs to clarify various points. Ampco Metal Inc., 1745 S. 38th St., Milwaukee 46, Wis. **L-3-3**

## Cylindrical Grinding

Handbook on cylindrical grinding contains useful information for engineers, methods men and operating executives, as well as operators and apprentices, on such aspects of the subject as work, table and wheel speeds, feeds, grinding wheel gradings, truing and dressing the wheel, use of coolant, common grinding troubles and their solutions, and operating and maintenance suggestions. Illustrated. Landis Tool Co., Waynesboro, Pa. **L-3-4**

## Thread Gage

Illustrated pamphlet, No. 612, demonstrates use of the electronically operated Rotochek for power thread gaging; emphasizing its speed, accuracy and other advantages. The Taft-Peirce Mfg. Co., Woonsocket, R. I. **L-3-5**

## Carbide Tools

Complete specifications and price lists for line of cemented carbide tools including company's expanded line of profiling tools, covered in illustrated catalog. In addition, technical data section includes data on their mechanical and physical properties, machining hints, suggestions for machining speeds, and for cutting tool grade selection, and a discussion of Kentanium. Kentametal Inc., Latrobe, Pa. **L-3-6**

## Coolant Filters

Two illustrated leaflets on coolant filters for industrial equipment; one contains data on late model Besly machines and the filters offered to fit their specifications; the second deals with filters for use on late model micromatic honing equipment. Each describes pertinent features and advantages of system, and shows drawing of the filter involved. Industrial Filtration Co., Dept. B-298, Lebanon, Ind. **L-3-7**

*There is hardly anything in this world  
that some man cannot make  
a little worse and sell a little cheaper,  
and the people who consider price only  
are this man's lawful prey.*

JOHN RUSKIN



Placed side by side, similar bushings of different make may look alike — *but are they?*

A·B·C Bushings are, and always have been made from only chromium, or chromium-tungsten oil hardening tool steels having wear resistance 18.5% greater than that of regular carbon water hardening tool steels.\*

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\*See "A special American Machinist report to the metal working industries" © 1950 by McGraw Hill Publishing Company. Quoted by permission.

## ACCURATE BUSHING COMPANY



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Permanently Magnetic Magna-Tip Hand Screw Drivers\*... bits for all types and sizes of screws and Magna-Tip Hex Drivers for hex head screws.

\*U.S. Patent No. 2,550,775.

Write for folder 95-E, information and prices:

**MAGNA DRIVER CORP.**  
779 WASHINGTON ST., BUFFALO 3, N. Y.

INDICATE A-3-151-1

## Pressure Gage

Unusual features of line of precision pressure gages outlined in catalog which includes discussion of design, construction characteristics, and their uses and installation. Well illustrated with drawings. Heise Bourdon Tube Co., Inc., Brook Rd., Newtown, Conn.

L-3-8

## Pumps

Informative 4-page bulletin describes Buna N and natural hard rubber pumps, valves and pipe fittings for chemical process and allied industries. Includes physical property and chemical resistance data, with performance data tables and specification charts. Vanton Pump & Equipment Corp., Empire State Bldg., New York, N. Y.

L-3-9

## Cleaners

Seven emulsion cleaners recently developed discussed in literature A-106 which covers product data on each cleaner including an outline of the advantages, physical features, and how to use them. Literature also contains "Emulsion Cleaner Reference Chart." Turco Products, Inc., 6135 S. Central Ave., Los Angeles 1, Calif.

L-3-10

## Steel Electrodes

Engineering data sheet (Special No. 10) deals with Walmang, an austenitic nickel manganese steel bare and coated welding electrode. Includes details on physical properties, application methods and welding, procedures for applying to manganese steel castings. Gives specifications and prices. Wall Colmonoy Corp., 19345 John R. St., Detroit 3, Mich.

L-3-11

## Burs

Extensive line of Kellerflex carbide burs described in 20-page publication; includes tips on proper use, resharpening, recommended speeds; also contains ordering information and specifications for each type and shape; examples are pictured in actual size. Includes ordering information. Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford 1, Conn.

L-3-12

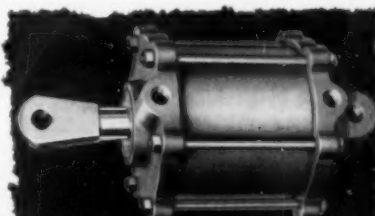
## Release Agents

Informative illustrated brochure presents details on three of company's silicones for the shell molding process, giving general properties, preparation for use, use and application, and various advantages. Linde Air Products Co., Div. of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

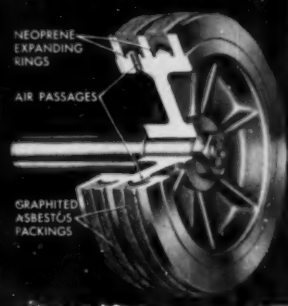
L-3-13



## AIR CYLINDERS



FAMOUS FOR LONG LIFE—  
LOW DOWNTIME



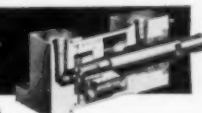
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INDICATE A-3-151-2

## Measurement

Instrumentation Data Sheet 10.0-5 offers discussion on "Nuclear Radiation Basis for Industrial Instrumentation," explaining its use for accurate measurement of film thickness, density, specific gravity and other intricate work. Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Aves., Philadelphia 44, Pa. **L-3-14**

## Floating Holders

Detailed discussion of "What to Look for When Selecting Floating Holders," presented in Vol. 1, No. 2 of Scully-Jones "Precision Holding News". Describes advantages of various types, and factors governing selection. Illustrated. Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8, Ill. **L-3-15**

## Drill Templates

Illustrated folder shows how to make laminate plastic anchor bushing drill templates for practical shop use, while text gives careful supplementary instructions. Technical information provided by qualified engineers in this field. The Hi-Shear Rivet Tool Co., 8924 Bellanca Ave., Los Angeles 45, Calif. **L-3-16**

## Brake Die Styles

Chart of 26 standard styles offered as guide for selection of proper type of brake dies for bending and forming sheets of steel and other metals, included in literature covering line of 6 and 8-ft. press brakes. Service Machine Co., Inc., 562 Miller St., Elizabeth, N. J. **L-3-17**

## Strain Gage

Leaflet, Bulletin 4207, illustrates and describes hand type, dial micrometer-Whittemore strain gage for 1/8 and 1/16 inch gage lengths, pointing out main features and advantages. Baldwin-Lima Hamilton Corp., Philadelphia 32, Pa. **L-3-18**

## Fastening

Literature explains use, application, construction features and practical advantages of "Tap-Lok" inserts for connections in plastics, wood or soft metals. Groov-Pin Corp., 1125 Hendricks Causeway, Ridgefield, N. J. **L-3-19**

## Carbide Reamer Sharpening

"Shop Manual" offers users of carbide-tipped reamers concise data on chamfer sizes, recommended clearance angles, method of repairing OD's and flute faces and special sharpening techniques for specific applications; also includes information on sharpening set-ups and data on recommended diamond wheels. Illustrated. The Staples Tool Co., Cincinnati 25, Ohio. **L-3-20**

## Automatic Controls

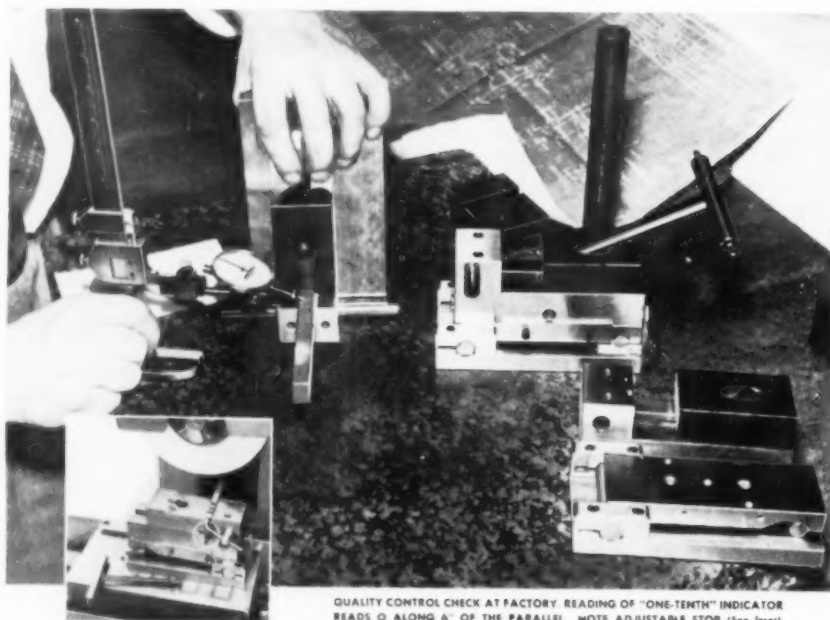
Extensively illustrated brochure provides information on control systems and their importance in automation, stressing consequent economy and improvement. Covers three divisions: hydraulic duplicating attachments for standard machine tools; designing and building complete control systems for machines; complete new tracer controlled machine tools. Turchan Follow-Me Machine Co., 8259 Livernois Ave., Detroit 4, Mich. **L-3-21**

## Delay Relay

Two-step pneumatically-controlled time delay relay to introduce sequence or time delay periods, or momentary impulse into electrical circuits described in Bulletin SR4; includes schematic diagrams. AGA Div., Elastic Stop Nut Corp. of America, Elizabeth, N. J. **L-3-22**

## Surface Measurement

Two 8-page illustrated brochures deal with instruments for surface measurement. The first, Bulletin LT89, describes operating features of the Profilometer, for measuring roughness, from user's standpoint, covering its versatility in use for production and quality control, and showing typical applications. The second, on the Wavometer, explains this instrument's use for measuring wavy irregularities around symmetrical surfaces of rotation; also tells why surfaces are wavy, and how to control this condition. Micrometrical Mfg. Co., Ann Arbor, Mich. **L-3-23**



QUALITY CONTROL CHECK AT FACTORY. READING OF "ONE-TENTH" INDICATOR READS 0 ALONG 6" OF THE PARALLEL. NOTE ADJUSTABLE STOP (See insert).

## New J & S Precision Grinding Vise square within 0.0001" or less in 1" in 4 positions

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This new J & S "Square-perfect" Vise is one of the most practical precision vises ever developed. Its many helpful features explain why.

It is square, for example, with 0.0001" or less in 1" in 4 positions. It is attachable to J & S 5" sine bar with 0.100" recess for small angles.

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Like all J & S workholding tools, it has a unique downholding clamping action. This assures dependable, accurate positioning of workpieces. An adjustable stop provides fast, sure positions for repeat operations. Workpieces can be loaded and unloaded rapidly.

### Holds Tapered, Odd-shaped Workpieces

The clamping jaw of this J & S Precision Grinding

Vise swivels to permit holding of tapered and odd-shaped workpieces. It holds round stock from 1/8" to 2 1/2" in diameter in Vee-block fashion. The range of jaw openings is from 0" to 3".

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## Steel

Two catalog sections present data on (1) Firth Sterling Best, a water hardening carbon tool steel, and (2) FS 25, a medium tungsten, vanadium cobalt high-speed steel. Each includes complete information as to typical analysis, characteristics, applications, forgings, general heat treatment, annealing, hardening and tempering. Firth Sterling Inc., 3113 Forbes St., Pittsburgh, Pa. **L-3-24**

## Automatic Testing

Pertinent information on recently introduced program controllers for automatic production and quality control testing presented in Bulletin 48, showing composite unit. Designed for production testing, proof testing, yield strength, stress cycling, strain cycling and crosshead cycling. Tinius Olsen Testing Machine Co., 1138 Easton Rd., Willow Grove, Pa. **L-3-25**

## Twist Drills

Circular No. 541 describes and illustrates company's metal cutting carbide tipped and solid carbide drill line; includes complete size and price information. Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich. **L-3-26**

## Silicone Rubber

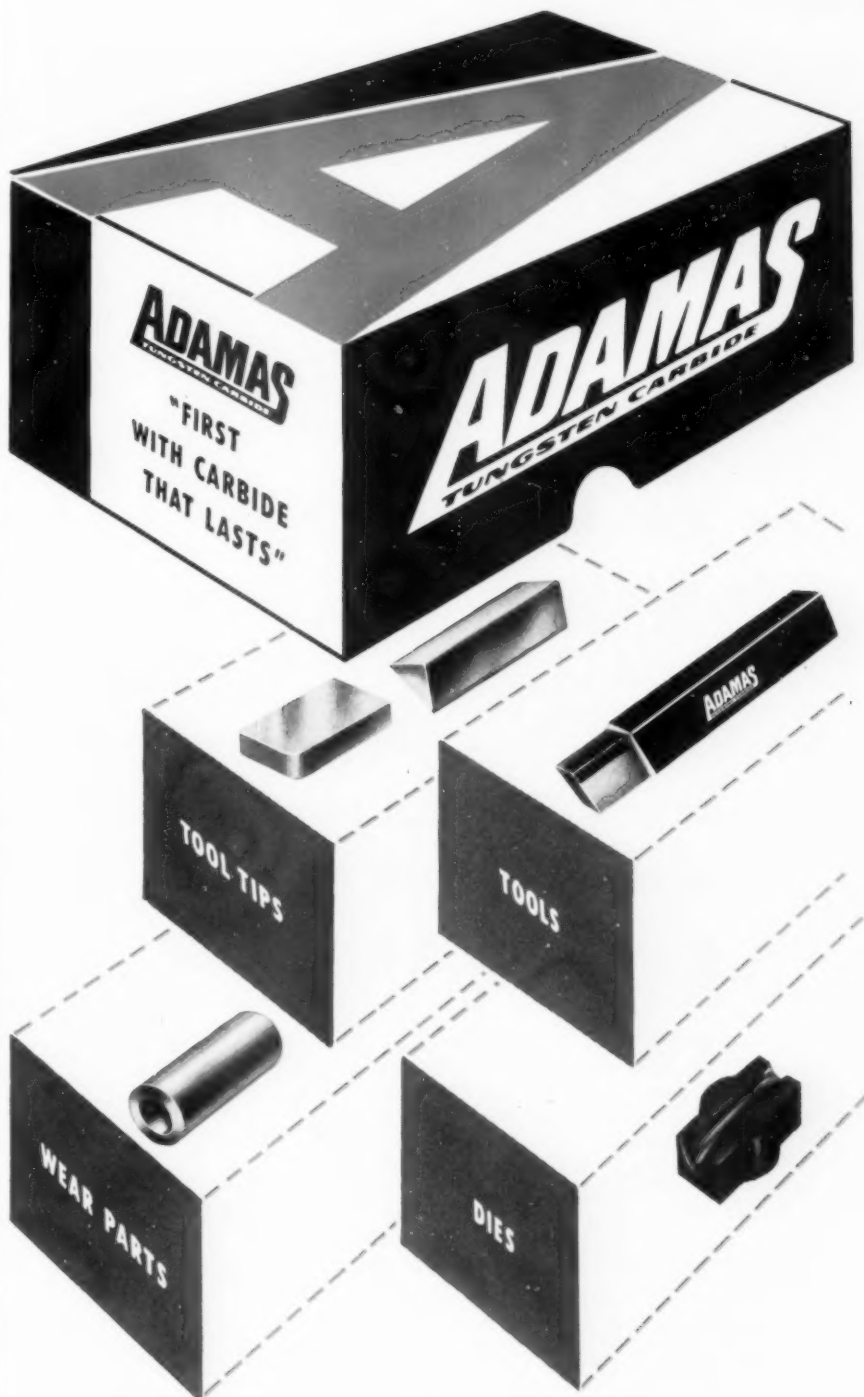
Brochure describes injection molding of Silicone rubber products; defines properties and applications of this substance; outlines its suitability for specific types of products. Dept. KP, Minnesota Rubber and Gasket Co., 5724 W. 36th St., Minneapolis 16, Minn. **L-3-27**

## Knives

Seventy-two page handbook on shear and slitter knives provides single source of basic information on use and maintenance; covers grades, recommended applications, tolerances, regrinding services; maintenance, proper grinding procedures and knife-setting recommendations. Request on company letterhead, direct to American Shear Knife Co., Homestead, Pa.

## Forging, Casting

Informative 27-page manual deals with hammered forgings, composite die sections and cast-to-shape tool steels; offered as guide to uses and types available; gives chemical analyses and heat treating instructions for common cast-to-shape grades; extensively illustrated with photos and drawings to illustrate various points. Allegheny Ludlum Steel Corp., Adv. Dept., 2020 Oliver Bldg., Pittsburgh 22, Pa. **L-3-28**



You'll find your tungsten carbide needs, whatever they are, best served under the big "A". It's the quickly-identified sign of the finest in carbide performance and service . . . adopted as standard today by leading metal working plants. It will pay you to know ADAMAS better, too . . . place your next order with ADAMAS and be convinced.

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## Production More Than Doubled by changing to a **KELLER RIVETER**

An electronic tube manufacturer boosted production from 62 to 155 pieces an hour by installing a Keller Compression Riveter in place of a kick press for staking the pins in vacuum tube bases. This 150% increase, achieved at relatively small cost, is typical of the results obtained by proper application of Keller Pneumatic Tools.

For riveting, staking, crimping, pressing, and marking operations, and for forcing fragile parts into a pressure fit, Keller Compression Riveters have the tremendous advantages characteristic of air power. They give a squeeze—not a slap—and exert maximum power only at the end of the stroke. This reduces shock and spoilage from cracked and broken parts.



*Send for* descriptive literature  
and detailed information

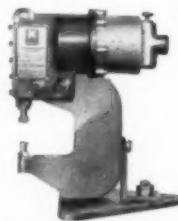
# **KELLER TOOL COMPANY**

GRAND HAVEN, MICHIGAN

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154

### *Facts in Brief* about **KELLER Compression Riveters**



- Air pressure gives a squeeze—not a slap
- Can be operated by foot valve or hand throttle
- Automatic cycle, stops at end of each cycle
- Portable, bench, or pedestal mounting
- Ideal for pressing, dimpling, staking, forcing, or riveting operations

### Hydraulic Components

Nine catalogs cover company's components line simplifying job of hydraulic circuit engineer. All basic data, such as photo, detailed dimensions, cross-section view, operating control drawing, etc. on particular product presented on single page or spread in an effort to eliminate cross referencing. Catalogs are: 601, pumps, motors and power units; 701, 150 psi air or 300 psi oil hydraulic cylinders; 721, 2000 psi cylinders; 741, 3000 psi cylinders; 801, 2000 psi valves, threaded connections; 821, 3000 psi valves, flange connections; 841, 3000 psi valves with gasket mountings; 901, accessories such as filters, gages, pressure switches, etc.; 1001, engineering manual on hydraulics. Request from Hydraulic Power Div., The Hydraulic Press Mfg. Co., Lincoln Ave., Mount Gilead, Ohio, specifying catalog required.

### Speed Reducers

Complete line of worm gear speed reducers, including company's new "powergear" reducer, presented in catalog No. 1006; also contains engineering information on selection of reducers, horsepower considerations, torque calculations and service factors. Eberhardt-Denver Co., 1403 W. Colfax Ave., Denver 4, Colo. **L-3-29**

### Fastening

Pamphlet outlines "48 solutions to fastening problems with the Rosán locking principle." Illustrates particular part to use to correct each of the problems. Rosán Inc., 625 Coast Hwy., Newport Beach, Calif. **L-3-30**

### Impregnation

Informative data, prepared by qualified metallurgist, offered in Report No. T-2 on impregnation; particularly aimed at design, production and quality control engineers facing problems with porosity in castings designed to hold gas or liquid under pressure; makes comparisons between custom impregnation and plant installation, analyses costs, amortization of equipment and results. Seal Cast Co., Inc., 2113-5 E. York St., Philadelphia 25, Pa. **L-3-31**

### Maintenance Products

Forty-page "Industrial Products Catalog" offers data on such materials as insulations, refractory products, packings, gaskets, electrical and frictional materials, as well as items for construction and plant maintenance. Includes photos, tables and diagrams. Johns-Manville, 22 E. 40th St., New York 16, N. Y. **L-3-32**

The Tool Engineer

## Technical Shorts...

**M**ETALIZED SURFACES with aluminum, without the use of heat, has been made possible by Emjay Maintenance Engineers, Rutherford, N. J., through development of a material called Kolmetal, which is a mixture of pulverized aluminum in a plastic base. The resultant coating, achieved by two applications of Kolmetal with a four-hour drying time between applications, air hardens to a plastic bonded aluminum surface which can be polished, ground, drilled or bent to a 45-degree angle without chipping or cracking.

### Aluminum Metalizing Without Heat

Extensive tests made by testing companies and in actual service, reveal that Kolmetal resists both atmospheric and sea-water corrosion. Further, it retains its finish and firm adhesion over a wide range of temperatures and, at the same time, demonstrates complete inertness to a long list of foods, beverages and liquid products.

Thus, results of the tests suggest Kolmetal as a coating for the interiors of all types of tanks—both to prevent the contents from contamination and to protect the interior from corrosive action of the contained liquid. It might also be recommended as an exterior coating for acid cooling coils since it has practically no insulating effect, yet offers protection for structural iron and steel, ducts and piping and a variety of industrial equipment and machinery.

\*\*\*

**W**HAT IS CONSIDERED the first commercial production of vacuum melted high temperature alloys has been started by Vacuum Metals Corp. Work is in connection with expanding production of high purity nickel alloys for electronic tube construction. The process, on a commercial basis, is the culmination of research work begun in 1946. Now the first commercial quantity orders from jet engine manufacturers have been received.

### Vacuum Melting of Alloys

Application of the vacuum melted product according to the engineers, promises better performance of the alloy in the engine, and also will increase ease of fabrication and higher yields. Importance of the development

is emphasized particularly since one of the principal obstacles in the way of continued improvement in gas turbine performance has been the requirement for materials with improved high temperature properties.

During the past year interest in vacuum melted high purity nickel, copper and iron, and dilute alloys of these metals for electronic tube components has increased steadily. Company researchers now indicate that in the first half of 1954, some of the alloys which have been hitherto produced on an experimental basis are being standardized for commercial production. Production tests show substantial increases in manufacturing yields of electronic tubes through utilization of some of these alloys. For such tube application, vacuum melting permits precise

## ARMSTRONG TOOL HOLDERS

*for every operation!*

There are ARMSTRONG TOOL HOLDERS in sizes and types for every operation on lathes, planers, slotters and shapers—for the heaviest cuts; for the most delicate cuts.

With Standard shaped cutters, bits and blades of ARMSTRONG HIGH SPEED, ARMALLOY (Cast Alloy) and ARMIDE (Carbide-Tipped) they provide a system of tooling that assures maximum production per machine hour, lower tool costs, and higher machining profits.

These permanent multi-purpose tools can be picked up as needed from your industrial distributor. Use them wherever possible to increase number of pieces per hour, to lower cost per pieces.

### ARMSTRONG BROS. TOOL CO.

*"The Tool Holder People"*

5257 W. Armstrong Ave., Chicago 30, Ill.

*Write for our New S-48 Catalog.*



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**YOU REPLACE  
Only  
THE PART  
THAT WEARS!**

# **new T-J REAMER**

**CUTS REPLACEMENT COSTS IN HALF!**

Just one shank to buy for wide range of sizes . . . when you use these new-type T-J Reamers with *interchangeable heads*! Sizes from  $\frac{1}{2}$ " to 2  $\frac{3}{4}$ " inclusive, in  $\frac{1}{16}$ " increments . . . spiral flute. Only the *heads* to buy for replacement—this cuts your costs to *less than half*!

Head has tapered hole which insures concentricity and a snug fit on smoothly ground tapered shank. Reamer operates free from binding or sticking, due to cutting portion wearing undersize and creating negative relief. Performance retains all advantages of standard, expensive reamer. Backed by T-J's 38 years of know-how as one of largest manufacturers of die sinking milling cutters.

The Tomkins-Johnson Co., Jackson, Michigan

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**T-J**  
**TOMKINS-JOHNSON**  
MILLING CUTTERS . AIR AND HYDRAULIC CYLINDERS . CUTTERS . CLINCHERS

**38 YEARS EXPERIENCE**

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control of very dilute alloying additions as well as of trace impurities to give tubes of improved dependability and performance.

At present, vacuum melted alloy steels for applications requiring high fatigue strength are under test.

\*\*\*

**A**N UNUSUALLY EFFECTIVE protective sheeting that successfully combats abrasion and corrosion has been developed by Magic Chemical Co., 121 Crescent St., Brockton 2, Mass. The substance known as "iron-rubber" gives protection to all kinds of equipment for to all kinds of equipment for long periods of time. Especially suitable applications appear to be hoppers and launders, ball mills, ducts and pipes, skips, housings, tanks, shaking tables, shot and sand blast cabinets, or other equipment normally subjected to excessive wear.

It is available in both reinforced and nonreinforced types. Reinforced iron-

**Iron for  
Equipment  
Protection**



Arrow points to protective sheet.

rubber is composed of two sheets of rubber permanently bonded to a central core of expanded steel. This type of sheeting can stand on edge without buckling, can be bent to fit corners without spring-back or can be shaped to fit practically any contour. Nonreinforced iron-rubber is a single sheet of rubber; much more flexible than the reinforced type, is light in weight and can be easily handled in large sections by one man.

The sheeting comes in standard sizes and thicknesses or can be fabricated to meet exact specifications, in any shape, in any thickness and to any length up to 36 inches wide.

Shown in the photograph, taken at the Bridgewater Foundry, Bridgewater, Mass., is a  $\frac{3}{4}$ -inch thick sheet of iron-rubber inside a large Wheelabrator at the point of ejection of the shot. A 1-inch thick steel plate at this point wears

out in one week, while this sheet of iron shows little signs of wear after six weeks. The walls and table of the Welding Laboratory may also be protected to minimize wear on the steel surfaces.

\*\*\*

**T**HE PATENTS in the continuous vacuum coating field have been granted to the National Research Corp., indicating the rapid advances in this direction.

#### Patents for Vacuum Coating

These particular patents covered apparatus, processes and methods concerning vapor coating, and vapor deposition.

The batch coating process is well established as the low-cost way of producing metallized work—for example, functional objects requiring bright reflective coatings, metallized plastic medallions, costume jewelry, etc. The continuous vacuum coating process utilizes the same principles for deposition of aluminum or other metals upon rolls of flexible material, such as plastics, textiles and paper. By evaporating aluminum under high vacuum on rolls of flexible substrates, decorative and functional materials are produced which are used to make such products as electrical condensers, wrapping papers, sequins, gold-leaf substitute transfers and reflective or beaded materials for movie screens.

The research company now is licensing these patents, as well as others previously obtained covering apparatus or processes in this field.

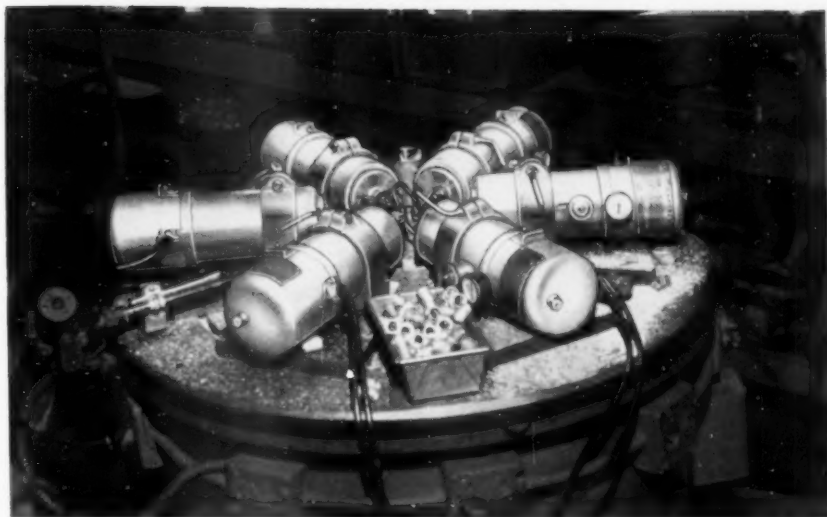
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**O**NE WAY to get a supply of properly equipped men is to train them. Taking advantage of this knowledge is The Hobart Brothers Co., which has for a lengthy period sponsored a welding school—The Hobart Trade School. Through the school system, which turns out well trained, qualified, skilled welders with a thorough knowledge of the field pertaining to their skill, manufacturing concerns, repair shops, metal-working industries all benefit.

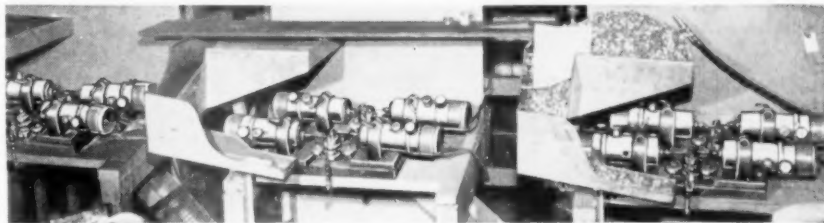
#### Skilled Welders Through Schooling

Although Hobart sponsors its programs, the school trains men in every phase of modern welding with the latest equipment. Originally the school was started to promote progress in the welding industry. Now, however, it has earned a reputation for developing improved welding techniques.

The nonprofit school now operates 16 weeks and covers both electric arc welding and oxyacetylene welding, cutting and related subjects.



## Tooling simplified...output up...drill costs down



#### ...with exceptionally versatile Dumore Automatic Drill Heads

**H**ERE'S the story of another successful investment in Dumore Precision Tools. To mass-produce a variety of small holes in connector plugs, Cannon Electric Mfg. Co. of Los Angeles bought 16 Automatic Drill Heads.

Today, these Drill Heads are being used in multiple-head setups of four, six or eight heads per unit.

How efficient are they?

In one six-head, radially-mounted setup, production was upped 100%. On another job where all 16 heads were set up in four-head units, production was tripled. Speaking of the Dumores, Cannon's chief production engineer says, "We're very pleased. They've increased production, cut drill breakage and simplified our tooling."

#### About the pictures above:

##### Top Photo — PRODUCTION UP 100 %

This operation involves drilling 0.1285" through holes to a maximum of 3/16" in die-cast aluminum connector plug. Previous production, 200 pieces per hour—with Dumore's it's up to 600. Note simplicity of setup due to fact Dumores need no outside air or hydraulic supply, merely plug in electric outlet. When production requires, two more Dumores are quickly, easily added to setup.

##### Bottom Photo — OUTPUT TRIPLED

Here are the Cannon Electric Mfg. Co.'s Dumores mounted in setups of four heads each. They're producing No. 49 and No. 18 holes to a depth of 3/16". In an hour, the Dumores complete 750 of the die-cast aluminum alloy parts compared to 250 previously.



If you're interested in obtaining similar all-around production, cost and tooling benefits—get in touch with your Industrial Distributor or write:

#### DUMORE PRECISION TOOLS

The Dumore Company

1325 Seventeenth Street • Racine, Wisconsin

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# Field Notes . . .

**Highly original** in the industrial field is the plan for Tool-Lease just offered to industry by Kearney & Trecker Corp. The arrangement lays a cooperative program before companies who find themselves at a point where new tooling is imperative in their facilities, yet where other demands for working capital complicate the financial picture.

With these things in mind, as well as its own interests, Kearney & Trecker evolved the Tool-Lease Program, placing its entire line of new equipment within the plan. The arrangement, which involves a seven-year period, gives a choice of three variations.

They differ in the options permitted—Plan A offers the lessee the right to terminate the lease at the end of the third year or any time thereafter, or to purchase the machine at the end of the third year or any time thereafter at a

specific percent of the original list price of the machine. Plans B and C are the same except that the purchase options involved are at the end of the second or the first year respectively.

Specifically, under Plan A, rental charges are 25 percent of the list price for each of the first three years, plus a payment for the machine also based on percentage at the end of the rental, should decision be made to purchase.

Plan B calls for a 30-25-50 percent graduation in rental, and Plan C follows 35-25-15 percent scale. All three plans call for 10 percent per year rental during the last four of the seven years lease agreement.

In addition, the Tool-Lease Program assures users of the use of the machinery as long as needed without committing the company to total life of the machine, and consequently freedom from risk of high obsolescence.

## new firms

**Entry into** the metal finishing industry has been made with establishment of The G. S. Equipment Co. at 5317 St. Clair Ave., Cleveland, Ohio. The firm was organized by the officers and directors of The General Supply Co. of that same address, and will take over all equipment sales formerly handled by that firm. General Supply will continue to serve the metal finishing industry with supplies only. The new company already is developing equipment of its own design for manufacture.

**Formation of** Sciafe Development Co., a fully-owned subsidiary, has been announced by Scaife Co. of Oakmont, Pa. The new organization is the exclusive licensing agent in this country for a hot extrusion process which is a modification of the Ugine-Sejournet tube extrusion process using glass as lubricant. Patent rights on the process are held by the French firm, Comptoir Industriel D'Etirage et Profilage de Metaux, Societe Anonyme.

**An interest in** The Keystone Conveyor Co. of Detroit has been purchased by The Rapids-Standard Co., Inc. New name of the Detroit firm is Rapistan-Keystone, Inc. It manufactures endless chain conveyor. Management and sales

organization are unchanged except for the addition of Nathan C. Snyder as secretary and Eugene Hummel as treasurer.

**A West Coast** manufacturing affiliate has been established by Colonial Broach Co. in cooperation with Demco Tool Co., Inc. The new firm, known as Colonial Western Broach Co., is located in Los Angeles. Manufacturing operations, which will be used to turn out broaches, broaching fixtures and gages, will follow the pattern of techniques and equipment developed and used by the parent company. Operations will be under the direction of Peter Starman, manager, who also is president of Demco Tool, which company will handle its sales exclusively.

At the same time the capital stock of Stupakoff Ceramic and Mfg. Co. of Latrobe, Pa., has been acquired by Carborundum. It will continue operations under its present name and organization and personnel under the direction of Semon H. Stupakoff, president of the company. According to Gen. Robinson, the acquisition will greatly extend Carborundum's activities in the rapidly growing electronics field. Stupakoff manufactures ceramic and other components used in that industry.

**Sale of design** and manufacturing rights of Titeflex industrial filter for

the chemical and processing markets, has been made to Croll-Reynolds Engineering Co., Inc., 17 John St., New York 38, N. Y. According to John J. Quinlan, sales manager of Croll-Reynolds, the purchase was made to provide a more complete service to the chemical and process industries. At the same time, the inventory and manufacturing facilities used in the production of this equipment also was acquired from Titeflex.

## expansions

**Additional shop** and inventory storage space is provided by the new 7500 sq-ft building at 3610 S. Broadway, Los Angeles, Calif., recently completed for Louis Levin & Son, Inc. The facility also permits space for the company, which manufacturers jewelers' type lathes, micro-drill presses and other precision tools for micro-machining, to display and demonstrate their tools at work.

**Kennemetal Inc.** has announced further expansion with the present construction under way for a manufacturing plant and office building at 10201 Capital Ave., Oak Park, Mich. Completion of the plant, which will be used for production of tungsten carbide tools and specialties, is scheduled for April 1.

**Completion of** a 27,000-ft addition to its factory and the installation of considerable new equipment for the manufacture of low carbon ground flat stock, has been announced by Marshall Steel Co. The facility is located at La Grange, Ill.

**Formal opening** of General Electric Co.'s \$1,600,000 Apparatus Service Shop and warehouse was made with a two-day open house. Capable of repairing any type of electric apparatus either in the shop or at the customer's plant, the new shop will serve eastern Pennsylvania, southern New Jersey and Delaware. Its location is at Erie Ave. and I St., Philadelphia.

**Burg Tool Mfg. Co.** of Los Angeles, has announced the opening of the Midwestern Burgmaster Machinery Co. in Chicago, Ill. The office, which will be devoted exclusively to sales and service of Burgmaster products in Midwestern states, is located at 5329 Lincoln Ave. Management is under R. A. Gorman.

**More than \$2,500,000** will be spent this year by Westinghouse Electric Appliance Corp. to rearrange and expand the Appliance Div. plant in Mansfield, Ohio. This is announced as the first step in a program to approximately double production of several major

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applied as well as substantially in-  
crease production of portable appli-  
ances. According to the announcement,  
more than \$2,000,000 of the expendi-  
ture will be used to replace machinery  
for new equipment, much of which will  
be used to replace machinery now being  
shipped to the new plant in Columbus,  
Ohio.

Completion of plans to enlarge  
manufacturing facilities at its Terre  
Haute, Ind. Works has been announced  
by Allis-Chalmers Mfg. Co. According  
to W. A. Roberts, president of Allis-  
Chalmers, the additional 84,000 sq-ft  
will permit much needed production  
facilities to manufacture items previ-  
ously subcontracted. Necessary ex-  
tensive tooling is expected to account  
for the major portion of the \$4,250,000  
for tools, equipment and building.

Addition of a modern warehouse at  
554 Deering Rd., N.W., Atlanta, Ga.,  
to the facilities of Whitney Chain Co.  
will serve to expand the company's  
services to Southern industry, beyond  
the sales and service office previously  
located in that city. The new warehouse  
is designed particularly for efficient  
stocking and handling of power trans-  
mission products.

Announcement of completion of its  
new branch warehouse at 3027 Fruit-  
land Ave., Vernon, Calif., a suburb of  
Los Angeles, has been made by Detrex  
Corp. The unit, which also will serve  
to house a drumming plant and offices,  
doubles the size of former facilities  
there.

Work is under way on the first unit  
of an expansion program representing  
an \$8,000,000 investment by U. S. Elec-  
trical Motors Inc. This plant, which  
will house the Defense Products Div.  
for the building of aircraft electrical  
motors, is located on Santa Ana Free-  
way, Anaheim, Calif.

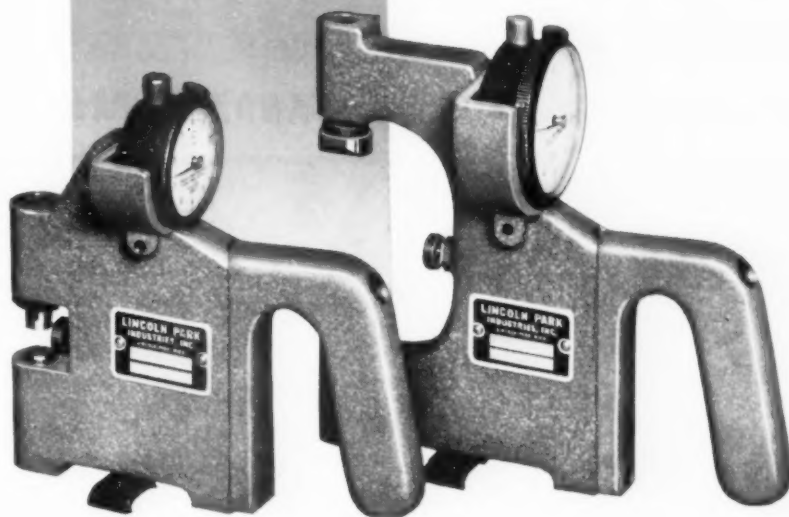
More than \$1,000,000 will be spent  
on the recently started expansion pro-  
gram of Carboloy Dept. of General  
Electric Co. before its completion,  
scheduled for late this year. The pro-  
gram includes addition of 36,000 sq ft  
of floor space to its metals building  
plus new engineering and manufactur-  
ing equipment. It also will allow re-  
arrangement of toolroom production  
engineering and equipment develop-  
ment facilities, and also make use of  
16,000 sq ft of vacated space for addi-  
tional advanced engineering facilities  
such as pilot plant and laboratories.

A quarter-million dollar expansion  
program has been announced by Mack-  
intosh-Hemphill Co. for its Midland,  
Pa., foundry. One of the largest verti-  
cal milling machines ever built, an  
Ingersoll, is included among the antici-  
pated new equipment.

A

NEW

LINE OF



## DIAL SNAP GAGES

Again, Lincoln Park Industries steps forward with a new  
development in snap gages that means further help to  
your production. Note these real advantages:

**SIMPLIFIED DESIGN AND CONSTRUCTION**—Lincoln Park  
Dial Snap Gages are designed to give a direct reading from  
the measuring anvil to indicator. There are no bearings, levers  
or cams to get out of adjustment.

**PRECISION ADJUSTMENTS**—By means of its fine pitch ground  
thread screw attachment, the upper anvil can be adjusted within  
a  $\frac{1}{4}$ " range.

**WEAR-RESISTANT ANVILS**—The parallel anvils are supplied  
either carbide tipped or Carb-O-Plated.

**SHOCKPROOF**—Even when Lincoln Park Dial Snap Gages are  
used by inexperienced operators, there is no possibility of dam-  
age by accidental shock. The indicators themselves are encased  
in a housing to protect them from damage.

**CHOICE OF INDICATORS**—Any A.G.D. size indicator can be used.

**LONG LIFE**—Because these gages have a minimum of parts to  
wear or be replaced, maintenance is negligible and long,  
trouble-free operation is assured.

Send for our new Bulletin giving sizes and other information.



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CARBIDE ROTARY FILES • ALSO FACILITIES AND SKILLED PERSONNEL AVAILABLE FOR PRECISION PARTS PRODUCTION.

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March, 1954

159

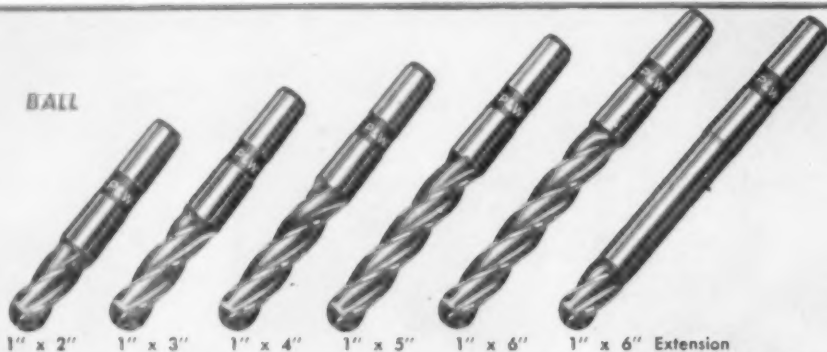
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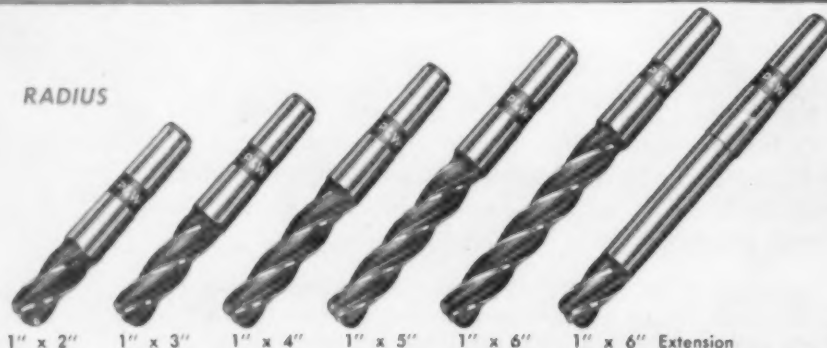


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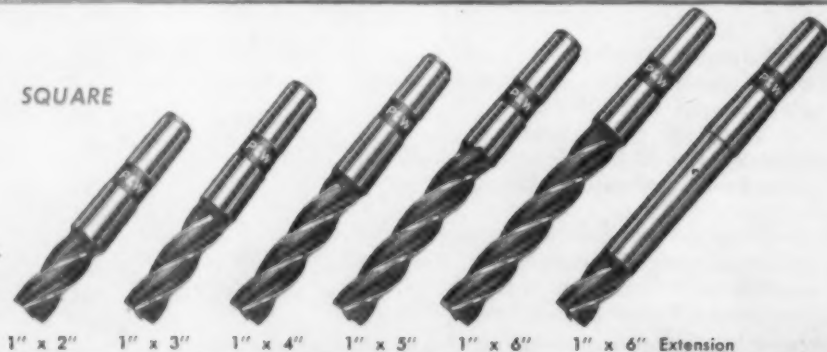
BALL



RADIUS



SQUARE



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MACHINE TOOLS • CUTTING TOOLS • GAGES

Work is now well under way toward the expected April 1 completion date of the new factory for American Bosch Corp.'s branch plant in Columbus, Miss. The unit will comprise about 100,000 sq ft of space which will be utilized for the manufacture of some of the company's automotive products.

### services

An addition to its line of "custom-built" air and hydraulic cylinders has been made by Miller Motor Co. which now offers for the first time "stock" cylinders in several hundred popular combinations of bore, stroke and mounting. The company suggests delivery within 24 to 72 hours from date of order to meet needs of designers, manufacturers and tool builders.

Departing from normal press brake sales practices, Verson Allsteel Press Brake Co. now announces availability of two standard models for immediate delivery from stock. By offering this standardized unit, Verson suggests that both small and large shops may be able to realize economy—the former will be able to utilize the advantage of this type power equipment; and the latter may use these brakes as an answer to the problem of tying up big machines with small jobs. The larger of the two, the No. 1062 has a 25-ton capacity and will bend 78 inches of 16 ga. mild steel over a 1/2-inch die opening. The second, smaller of the standard brakes, the 16-48, is rated at 15 tons capacity and will bend 48 inches of 16 ga. mild steel over a 1/2-inch die opening.

Wendt-Sonis has a new line of carbide blanks and inserts for reamers, tool bits, milling cutters and other tools added to its stock. Literature on the subject is available from the company in Hannibal, Mo.

Unground cartridge case die nibs are now being offered as a standard line by Carboly Dept. of General Electric Co.

### moves

Pittsburgh district office of the Monarch Machine Tool Co. has been moved from the Empire Bldg., where it was located for 17 years, to 962 Green-tree Road.

New quarters have been completed for The Producto Corp. The building, which will provide considerably more room for the company, is located at 10200 Capitol Ave., Oak Park, Mich., near Detroit.

**The Tool Engineer**

The survey Vogel Mfg. Co., formerly located on Raymond Ave. in St. Paul, Minn., has recently changed to larger quarters at Como Ave. and the Minneapolis city limits.

After more than 50 years of operation in Lower Manhattan, August W. Holmberg & Co., metal die and stamping firm, has moved to a new modern plant at 133-31 39th Ave., Flushing (Queens), N. Y.

General office and research-development department of Taylor Dynamometer & Machine Co. have been transferred to the recently completed building at 6411 River Parkway, Milwaukee, Wis. Some manufacturing and assembly work also will be carried on at the new location.

#### sales

At Joseph T. Ryerson & Son, Inc., Weaver E. Falberg has been made assistant general manager of sales of the sixteen Ryerson steel service plants around the country. At the same time, Roland W. Burt was appointed manager of the Chicago plant, a recently created position. Alfred J. Olson, formerly assistant sales manager, succeeds him as Chicago sales manager. . . .

**The position** of district sales engineer for Hydro-press, Inc., covering Michigan, Wisconsin and parts of Illinois, Indiana and Ohio, has been filled by Harold C. Sproule. . . .

**Richard H. Ewert** has been appointed general sales manager of Illinois Gear and Machine Co. . . . According to announcement from Northwestern Electric Co., Chicago, George D. Craig, Jr. has joined that company as general sales manager.

**Clearing Machine Corp.** has appointed Thomas Hamilton as salesman in the Detroit area. His headquarters will be Clearing's Detroit office at 10600 Puritan Ave. . . .

**New branch** manager of the Detroit office of Graton & Knight Co. is Robert C. Kerr, formerly sales engineer in that office. . . .

**Firth Sterling Inc.** has appointed John E. Hartman as assistant to the sales promotion manager. . . .

**Promotion** of Eugene H. Tegtmeier, sales manager, to the position of vice-president in charge of sales has been announced by the Tempel Manufacturing Co. At the same time, the company named Fred A. Slaughter, former assistant to the president, to the post of sales manager. . . .

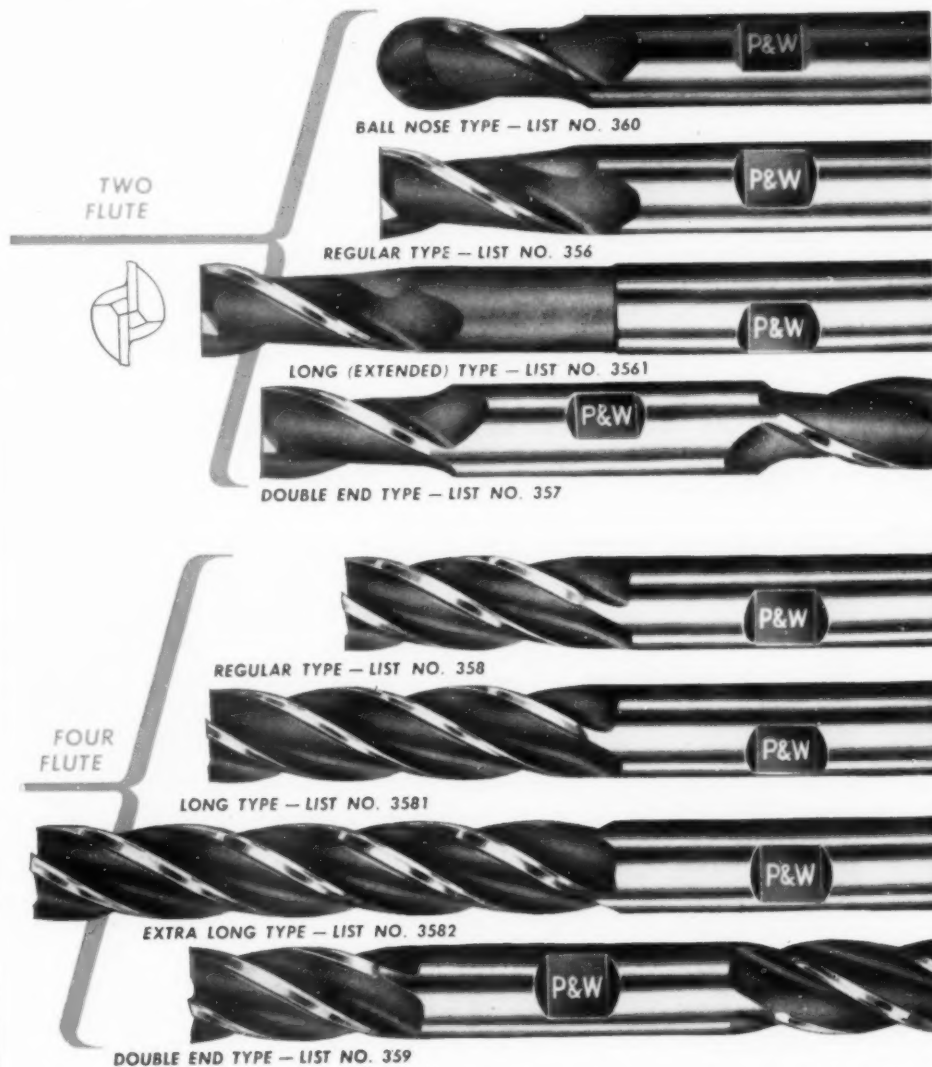
**Dan D. Felske** has been named vice-president in charge of

March, 1954



## All these 1/2 diameter HI-HELIX END MILLS

Available FROM STOCK at STANDARD PRICES



Four Flute Styles are available in Two End Tooth Designs



Cut-To-Center-Hole Type

Preferred for milling operations requiring radii on the end teeth.



Cupped Type

Preferred for all general milling operations.

FOR COMPLETE INFORMATION write on your Company letterhead for Circular No. 534.

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sales over all divisions of the Gear Grinding Machine Co. He will coordinate sales efforts of the company's grinding service and geargrind machine divisions as well as the Rzeppa universal joint division, which he has headed in the past.

**Post of general sales manager**, Alloy Metal Wire Co., Div. of H. K. Porter Co., Inc. has been filled with the appointment of E. H. Mann. He will be responsible for all sales activities of the company.

**A number of sales appointments** have been made at Reliance Electric & Engineering Co. C. B. Allen, Jr. is now district manager succeeding J. L. Buell, Jr. who resigned to join another manufacturing concern. At the same time appointments of six application engineers involved A. W. Bridges and L. W.

Kutz who were named to the Philadelphia district sales office; C. A. Emmert who joined the Baltimore staff; James W. Landers who went to the Newark office; William M. Morris, Jr., who joined the New Haven branch; William J. Constandse, who was added to the Cincinnati district office.

**Headquarters of Hy-Pro Tool Co.** has released the appointment of William A. Carlson as its direct factory representative in the Western New York and Northern Pennsylvania area. He will make his office in Rochester, N. Y.

**Several sales personnel changes** have been made by The Carborundum Co. John F. Claydon, formerly district sales manager of the Detroit area, is now director of sales, Coated Products Div. There he will direct activities of

the Industrial Sales Branch of that division. W. D. Dickerson, formerly assistant district sales manager in Chicago, succeeded Mr. Claydon as manager of the Detroit sales district. H. J. Jeffers is named sales manager of Bonded Products Grain, and J. G. Khoury, became sales manager of Coated Products in that district.

**H. E. Elliott** is now sales manager of The Watson-Stillman Co., division of H. K. Porter Co., Inc. He has been associated with the company for the past 25 years, and has been instrumental in developing many lines of Watson-Stillman hydraulic presses and equipment.

**Tinius Olsen Testing Machine Co.** has appointed Research Instrument Co. as their Ohio sales representative. Office of the sales firm is at 12410 Triskett Rd., Cleveland, Ohio.

**Two sales appointments** have been made by Udyllite Corp. Richard R. Russell has been named to the Atlanta, Ga. office to serve customers in South Carolina, North Carolina and eastern Tennessee; and George W. Egger has been assigned to the Chicago office to serve the Chicago, Aurora and Elgin, Ill. territory.

**Size Control Co.**, division of American Gage & Machine Co., has appointed Bert Lewyn as its representative in Georgia, Alabama, Florida and eastern Tennessee. His office is located at 770 Virginia Circle, N.E., Atlanta, Ga.

**At the same time** Size Control announced opening of a new office at Boston, Mass., in cooperation with Sterling Sales, Inc. The office, at 417 Cambridge St., Allston, Mass., will serve as headquarters for Joseph W. Sylvia, Thomas J. Fay and R. Shirley Ellis.

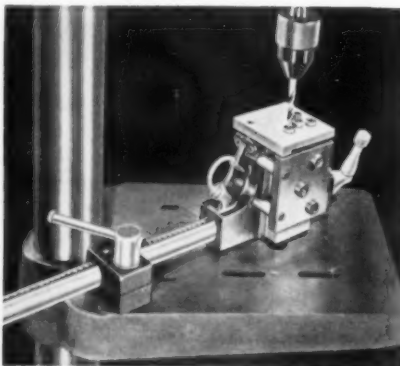
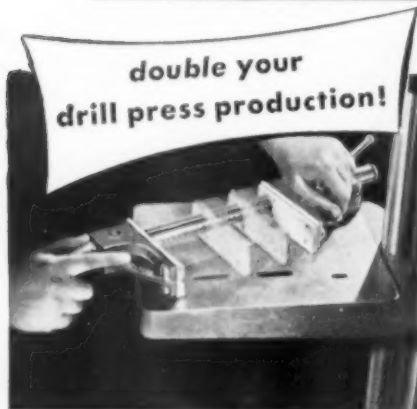
**Promotion of Fred W. Lee** to Connecticut district manager has been announced by the Bay State Abrasive Products Co. Connecticut office of the company is located in Bristol.

#### distributors

**Announcement** is made of the appointment of J. T. Monteith, 1074 Farmington Ave., West Hartford, Conn., as factory representative for Cleveland Industrial Tool Corp. for Connecticut and Rhode Island.

**Ira S. Latimer Co.**, 10600 Puritan Ave., Detroit, Mich. has been named to represent the steel Div. of Henry Disston & Sons, Inc.

## NEW AMF Float-Lock Instant-Change Safety Vise



IDEAL BASE FOR DRILL JIGS

Retaining its full-floating and locking features, but otherwise completely redesigned, the new AMF Float-Lock Instant-Change Safety Vise is faster, huskier, greater in capacity (9" and 12" jaw openings)... the most versatile, most economical work holder yet devised for drill presses!

New ratchet-locking jaw slides *instantly* to desired opening. The other, screw-operated jaw positively locks—or completely releases—work with a mere flick (about 1/4-turn) of the handle.

Vise turns over readily on three sides, permits extensive drilling without removing work. Horizontal and vertical "V" grooves align and grip rounds for end drilling, centering... ideal for angle drilling. Vise serves as low-cost drill jig when locked anywhere on the table... swings out of the way when not needed. Saves so much set-up time, compared with usual work-holding devices, that good operators should easily be able to double their production!



Contact your local AMF Float-Lock distributor for a demonstration. Or write for his name and address and a copy of new, descriptive Folder WF 53-1(a), Wahlstrom Float-Lock Sales Dept., American Machine & Foundry Company,



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-162

The California firm of Turner Metal Supply Co., 2314 Laura Ave., Huntington Park, is now distributor of Reynolds Aluminum in the Los Angeles area according to the announcement from Reynolds Metals Co. Turner will warehouse specialty aluminum wire, rod and bar products.

New representative for Rivett Lathe & Grinder, Inc. in the Kansas area has been made with the appointment of Ficke Engineering & Supply Co., 305 Pattie Ave., Wichita, Kansas.

Appointment of Sterling Sales, Inc., 787 Main St., Worcester, Mass., as its sole distributor in New England, has been made public by Rahn Granite Surface Plate Co.

#### more sales

Transfer of Howard C. Foster to the Clifton, N. J., branch office has been announced by The Gisholt Machine Co. Mr. Foster, who has been in machine service and engineering estimating, will handle both sales and service out of the Clifton office, located at 1051 Bloomfield Ave. Philip E. Denu continues as district manager, and John Leo remains as resident service manager.

Harry H. Jason is manager of the recently created New England sales district according to Carboly Dept. of General Electric Co. His headquarters is in Wellesley, Mass. . . .

Three New district representatives for its products have been named by Roll Formed Products Co. Towle and Son Co., 18 W. Chelton Ave., Philadelphia, Pa. will cover eastern Pennsylvania, southern New Jersey, Delaware, Maryland, District of Columbia and eastern Virginia. Richard S. Dirkes, 210 Van Brunt St., Brooklyn, N. Y., will serve northern New Jersey, southeastern New York State, and western Connecticut. Ferris and Co., 422 W. Roses Rd., San Gabriel, Calif., will handle Greater Los Angeles. . . .

Appointment of Kenneth A. Ayers as district manager of its Washington, D. C. office has been made public by Baldwin-Lima-Hamilton Corp. . . .

Kennemetal Inc. has named three sales representatives: Warren Eisenberg in the St. Louis District, Raymond Guenther in the Southern District and Robert Welch in the New England district.

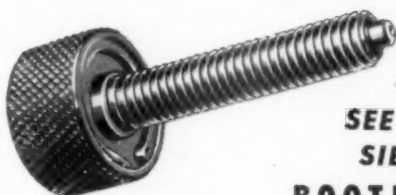
March, 1954

# NEW SIEWEK PRODUCTS



#### TOGGLE PADS

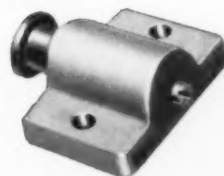
Toggle pads have 20° included angle of movement. Another Siewek exclusive is that they are available in National coarse and National fine threads.



#### TORQUE SCREWS

Over-tightening is impossible in the Siewek Torque Screw. Distortion of part piece is prevented by freely moving head when set pressure is reached. Dis-assembly for cleaning is simple.

SEE  
SIEWEK  
BOOTH 408  
AT THE  
TOOL SHOW



#### SPRING STOPS

Sizes offer:  
Stroke from 3/16" to 1/4". End Pressure—14 lbs. to 32 lbs.



#### SPRING PLUNGERS

Only Siewek has this exclusive feature in Spring Plungers—the hardened drill-rod nose.

**SIEWEK TOOL CO.**

2864 E. GRAND BLVD.  
DETROIT 2, MICH.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-163



# Men at Work . . .

Election of **Edgar G. Seybold** to the office president has been made public by the board of directors of The Hendey Machine Co., Inc. Mr. Seybold, who has served as executive vice-president for the past year, has been associated with the company since 1937. He succeeds **David Ayr** who retired last year after having served as president more than 21 years.

Other officers elected at the same time include, **F. W. Richmond**, chair-

man of the board; **Helge G. Hoglund**, vice-president in charge of sales; **Bernard Sassen**, vice-president in charge of engineering; **Arthur D. Patterson**, secretary and treasurer; and **Earl Betz**, assistant treasurer.

**Thomas Hinchliff** has been named project engineer for American Research Corp. His work will be concerned with low-temperature environmental test equipment.

**Robert S. Jones** has been appointed to fill the newly created position of manager of manufacturing at Jones & Lamson Machine Co. This appointment places responsibilities for the direction of manufacturing and labor policies for the entire company under one individual. At the same time, **James C. Hebert** was named manager of the Machine Tool Div. with responsibility for its operation. Both Mr. Jones and Mr. Hebert are members of ASTE Twin States Chapter.

The Baker-Raulang Co. has announced election of **William A. Bauer** to the office of presidency and the appointment of **Charles N. Sumwalt, Jr.** as executive vice-president. Mr. Bauer, who has been chairman of the board since 1951, will also continue in that position. Mr. Sumwalt formerly was vice-president in charge of the company's eastern sales division.

Five vice-presidents for the Lycoming Div. of Avco Manufacturing Corp. have been appointed. **Floyd J. Bird** also is plant manager, Williamsport; **Anselm Franz** heads turbine engineering; **James E. Mitchell**, industrial relations; **Arthur Nutt**, engineering; and **Donald F. Turner** is also plant manager, Bridgeport.

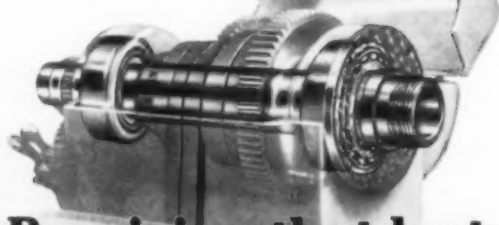
The engineering vice-president of Reliance Electric & Engineering Co., **William R. Hough**, has been elected a director of the company. He has been associated with Reliance since 1929.

Tuthill Pump Co. has named **Robert Von Rotz** chief engineer. Mr. Von Rotz brings to his new position 27 years' experience in both technical and management work. Prior to his joining Tuthill, he was chief engineer with Applied Research and Development Corp.

According to recent announcement from Carborundum Co., **W. J. Ulrich** has been elected vice-president of the company. Mr. Ulrich also will continue his previous sales activities in the Detroit area; however, he will report to the vice-president of sales in Niagara Falls, N. Y.

At the same time, announcement was made of the election of **F. W. Bonacker** to assist vice-president in charge of sales for the company's Bonded Products and Grain Div.

## SHELDON CHICAGO U.S.A. PRECISION LATHES



### Precision that lasts

... "ZERO PRECISION"  
TAPER ROLLER BEARINGS

No lathe can be more accurate than its spindle bearings. Hence before buying any lathe one should check the exact type and tolerances of bearings used!

All SHELDON Precision Lathes have "Zero Precision" Taper Roller Bearings, held to tolerances of .00015"—more accurate than the bearings found in most lathes. They are also the sturdy type that hold their accuracy thru long hard use . . . hold it even under abuse. With the other stamina features built into SHELDON Precision Lathes, they assure continued accuracy, without costly maintenance, thru years of hard service.

Write for Catalog

**SHELDON MACHINE CO., INC.**

4229 N. Knox Ave., Chicago 41, Illinois

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-164

**SHELDON**  
"Stamina" Features:

- Rigid, Heavily cross-strutted 1-piece Beds—2 V-ways, 2 Flat ways
- Full Double-Walled Aprons—all gear shafts supported on both ends.
- Heavy Carriage with wide bearing on bed.
- Twin V-Belts to Spindle for extra power.



Wallace L. Howe has been elected vice-president in charge of research and development and to the board of directors of Norton Co. He has been director of these activities for two years.



S. B. Withington is president of the newly consolidated Lycoming Div. of Avco Mfg. Corp. He also continues as general manager of Lycoming and as vice-president of the parent company.



Theodore C. Koch, formerly vice-president in charge of manufacturing of Ace-Central States Machine Tool Co., is now general manager. He continues as vice-president of Ace Tool and Die Co.

At the Norton stockholders' meeting where Mr. Howe was elected a vice-president, **John M. Cook**, vice-president and general sales manager of Behr-Manning Corp., a division of Norton, became a director. **Henry M. Elliot**, first vice-president of Behr-Manning, retired as a Norton director, **George N. Jeppson** was elected chairman of the board, and **Milton P. Higgins** president.

**Edward J. Pratt** has been elected first vice-president and **John S. Gorski** second vice-president by the board of directors of Amco Gage Co. Mr. Pratt is general manager of the company, while Mr. Gorski is the firm's general superintendent.

**F. Gordon Borowsky** has been elected president of **George K. Garrett Co., Inc.**, while its former president, **A. G. Borowsky**, was elected chairman of the board.

**Sam D. McIlwain**, formerly production supervisor at the Westinghouse Corp., has joined **Detroit Stamping Co.** as product engineer. At the same time, announcement was made of the appointment of **John M. Thullen** as purchasing agent for all industrial raw materials, production parts, services, finished stores and general factory supplies. Previously, Mr. Thullen was associated with the **Harry Ferguson Co.**

Two head office posts have been set up by **Shell Chemical Corp.** as a consequence of growing size and complexity of manufacturing activities. **B. M. Downey**, manager of the Houston, Tex., plant has been appointed manager of manufacturing and **A. W. Fleer**, manufacturing operations manager, has been named manager of research, development and engineering.

**NEW**  
**40,000 RPM**  
**ROTOR PENCIL GRINDER**  
**pays for itself**  
**in 3½ weeks**

#### PENCIL GRINDER FACTS

WEIGHT . . . . .	13 ounces
LENGTH . . . . .	5¾"
DIAMETER . . . . .	1"
FREE SPEED . . . . .	40,000 RPM
COLLET . . . . .	¼" or ½"
For dies, patterns and 1001 grinding jobs.	

**JOB**—High pressure ½" diam. tubing for condensers—grind welds smooth. Used heavier die grinders. Took 15 minutes per weld.

**SOLUTION**—Tried new Rotor Pencil Grinder. Operates at 40,000 RPM.

**RESULTS**—Grinding time cut 7 minutes per weld, or 46.5%. This "pay-off" amounts to \$22.32 per week—pays for grinder in 3½ weeks. Mounted points last twice as long, adding to savings. Customer bought 8 Rotor Pencil Grinders.

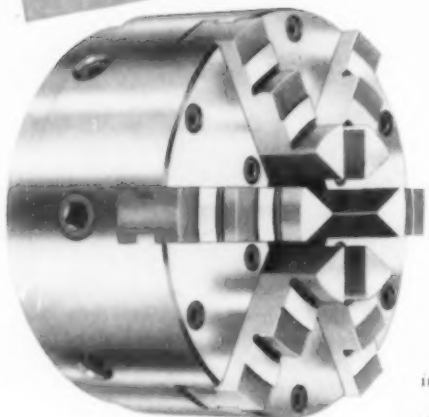
Find out how this new grinder and other new Rotor Tools can save you time and money! Ask for a demonstration.

**THE ROTOR TOOL CO.**  
CLEVELAND, OHIO  
UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEM

SCREW DRIVER      IMPACT WRENCH

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**YOU SAVE**



This is the only universal scroll chuck with .0005" precision. It is used on lathes, grinders, dividing heads, screw machines. Does most of work formerly requiring stub arbors, mandrels, special fixtures.

**6 JAWS**



**OR 3 JAWS**

3-jaw and 6-jaw models in 4", 5", 6", 7 1/2", and 9" sizes. 2-jaw Aviation chucks, for holding odd shaped parts in 6", 7 1/2", and 9".

**Every  
Time You Use  
Buck**



Save machinists' time — lines up dead true in one minute, without shims . . .

Save operators' time — holds .0005" re-chucking precision on duplicate parts . . .

Save collet and step-collet costs — the AJUST-TRU does the work of hundreds of dollars worth of collets . . .

Save distortion on tubular work . . .

Save scratches on ground, polished, work . . .

Save time and expensive holding fixtures on many grinding operations . . .

Save chuck wear — it takes up wear in use . . .

More than ever today, you need the economies of Buck chucks. Send for latest catalog.

**BUCK TOOL COMPANY**

333 SCHIPPERS LANE • KALAMAZOO, MICH.  
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**VIBRATIONS CAN BE BEAUTIFUL!!**



**BUT...**

**VIBRATION**

due to unbalance is the reason carbide tipped milling and other RPM tools do not go 2 to 3 times longer between sharpenings.

**AIRCRAFT SPAR MILLING CUTTER MOUNTED ON MODEL 704 BALANCER FOR PRECISION DYNAMIC BALANCING.**



Because of quick setup and job-type characteristics, the Model 704 Stewart-Warner industrial balancer is excellent for precision dynamic balancing of tools and machinery, as well as your finished product. PRECISION BALANCING in the tool field — tested, proved accepted. Write to

**MERRILL ENGINEERING LABORATORIES**

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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-166-2

With the reorganization of Industrial Ovens, Inc., the board of directors has announced several personnel changes. **Howard R. Richards** was elected president and general manager; **Walter E. Allen** became vice-president and treasurer; **Louis A. Litzler**, secretary; **A. V. Alexeff**, chief engineer, and **E. W. Baumgardner** was appointed sales manager.

Allied International, Inc., has appointed **E. B. Conley** vice-president and general manager of its manufacturing plant, Allied Engineering Div. In this capacity, Mr. Conley will be in charge of all manufacturing operations in the plant.

Election of **George L. Guymon** to the board of directors is announced by Industrial Filtration Co. Mr. Guymon, vice-president and director of sales for Delpark industrial filters, introduced the Delpark automatic filter to the trade in 1950.

A new technical director has been named for Alloy Metal Wire Co., Div. of H. K. Porter Co., Inc., with the appointment of **R. W. Sandelin**. He will head the metallurgical department and be responsible for quality control.

Three appointments at the Passaic, N. J. plant of Raybestos-Manhattan, Inc. involve **C. P. McHugh**, who is now assistant director of research and product design; **S. F. Horesta**, who now succeeds Mr. McHugh as manager of the Roll and Tank Depts., and **E. D. Hines**, previously sales engineer in the Tank Dept., who now takes Mr. Horesta's former post as assistant manager of the Roll and Tank Dept.

**John C. Ketterer** has been named assistant superintendent of operations at the Midland, Pa., plant of Mackintosh-Hemphill Co. **Wilson J. Rhodes**, who has been with the firm since 1947, succeeds Mr. Ketterer as manager of production at the Midland Plant.

With the announced decentralization of its Shakeproof Div. along product lines, physical facilities and organization responsibilities, Illinois Tool Works has subdivided the division into three production units, each with its own organization group, headed by a general manager. **Andrew L. Pontius**, formerly works manager of the Shakeproof Div., now heads the Standard Products Unit; **Carl F. Jensen**, previously plant manager of the Division's Des Plaines, Ill., plant leads the Special Stamped Products subdivision; and **Silas S. Cathcart** directs the activities of the Plastic Products unit.

## Abstracts of Foreign Literature

By M. Kronenberg

### Metal Milling Cutters

Milling cutters made of carbon steel bodies with high-speed teeth cast integrally into one piece have been made in Russia according to a report published in Issue No. 12 of *Werkstattstechnik und Maschinenbau*. The report in the German magazine is a description of a new process developed by I. A. Mosgowski which was published in *Wjestnik Maschinostrojenija* 1952 Issue No. 12, pages 57 to 61. The process is used primarily for producing milling cutters although other rotary tools can be made that way.

The two steel materials are poured into a mold which is rotated about a horizontal axis at a circumferential speed of about 1800 feet per minute. This speed has been found best for formation of teeth of uniform thickness. The mold consists of two lids and a ring made of metal; they are held together by a metal strip, which can be used for different sizes of the cutters.

The castings remain in the molds until they have cooled to about 1300 F and are left in the open air thereafter. They are annealed and heat treated three times and then machined. The outer surface has a hardness of 62 Rockwell C, decreasing gradually to 38 Rockwell C towards the body.

Tool life is about the same as that of other high-speed steel cutters; the advantage of the process lies in the high production rate. The cutters can be produced in only one fifth of the time required hitherto. The amount of high-speed steel needed is reduced about 75 percent from that of a standard cutter.

### Machine Tool Developments

Recent developments in machine tools are discussed in *Werkstatt und Betrieb* Issue No. 11, 1953 using the examples exhibited at the Brussels machine tool show in September 1953. Of more general interest among the described machines is a horizontal boring mill for carbide tools where the spindle carrier travels axially with the tools in order to obtain a better support and increased rigidity. In a Belgian milling machine, slide rules have been incorporated rendering it possible to convert optimum cutting speeds, determined from a

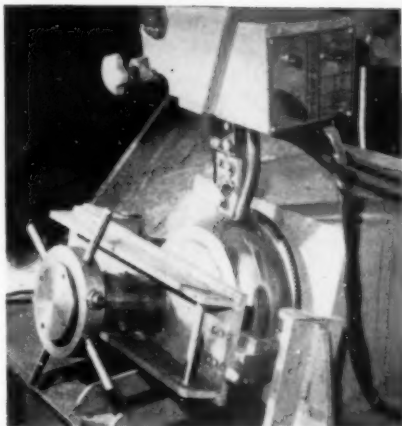


Fig. 1. Weld-assemblies front and rear halves of outer case for new torque converter. After work is loaded and clamped with capstan screw, operator pushes button, "Automatic Lincolnweld" head lowers as work starts to rotate at preset speed. Welding is done with  $\frac{1}{8}$ " diameter electrode in blanket of Lincoln 760 Agglomerated Flux. Production is 60 welded assemblies per hour.

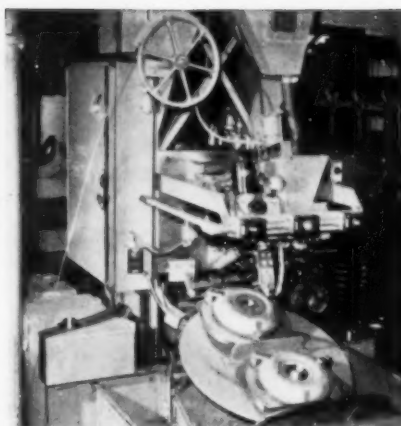


Fig. 2. Weld-assemblies drawn cups to front plates for torque converters. Work is mounted on fixture of indexing table while previous assembly is welded. Open end of cup has a turned step for press fit to joining component. Mating walls are at right angles and are fillet welded to pressure tight joint. Production is automatic... 80 pieces per hour with potential increase to 120 pieces per hour.

## LINCOLNWELD...

automatic push-button welding  
that can simplify your production methods

**A**UTOMATIC WELDING is now possible at unusually low cost using versatile "Automatic Lincolnweld". Compact in design and completely controlled, the "Lincolnweld" head is adaptable to all types of production machinery to transfer welding skills to the machine and simplify production operations. Welds are made automatically at preset speeds... are uniform, top quality, and self-cleaning to cut production manhours and save over 50% over hand welding methods.

A Lincoln specialist in automatic welding near you will gladly show you how to adapt "Lincolnweld" to your production machinery. If you wish, he will work with your equipment builder to develop the most efficient designs, assuring quality production at lowest cost. Call or write Dept. 5001.

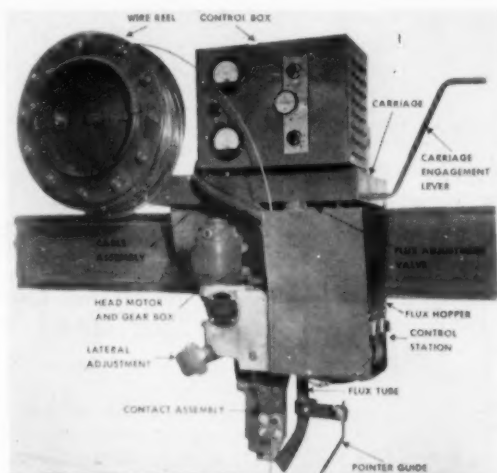


Fig. 3. "Automatic Lincolnweld." Individual operating units such as control box, control station, drive unit, and wire reel can be mounted separately to meet any requirements.

## THE LINCOLN ELECTRIC COMPANY

Cleveland 17, Ohio

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

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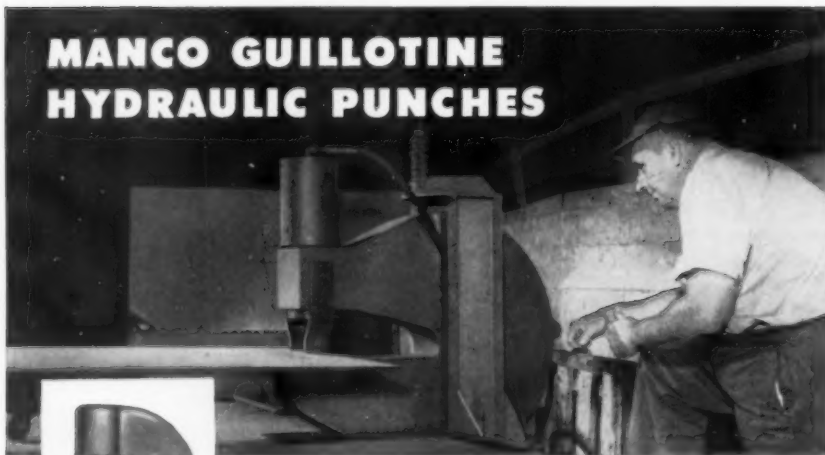
"No, Pete hasn't been here 40 years — he hit the jack pot by suggesting EXL-DIE."

**COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.**

Producers of fine tool steels — All types immediately available through Sales Offices, Warehouses and Representatives in Principal Cities.



## MANCO GUILLOTINE HYDRAULIC PUNCHES



**Model P-20-186**  
Capacity 1" hole in  $\frac{3}{4}$ " mild steel. Reach 15". Weight 44 lbs. Available with high-speed electric hydraulic or portable manual pump.

### HIGH CAPACITY . . . STRUCTURAL OR FIELD WORK

There is a wide variety of fast, powerful Manco Guillotine Hydraulic punches with varying capacities, available for stationary production use, semi-portable boom-mounting, or complete portability for use in the field. Model P-75-E, above, equipped with Manco high-speed electric hydraulic pump offers 75 tons thrust and capacity for 1" hole in  $\frac{3}{4}$ " steel. Other models up to maximum capacity for punching  $3\frac{3}{4}$ " hole in 16-gauge sheet.

Write, stating requirements: hole size, location, quantity, accessibility, material punched

Dept.  
T-3

**MANCO MFG. CO.**

Bradley, Illinois

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table into spindle speeds corresponding to the tool diameter. The feed rate can also be converted into those that can be obtained on the machine for full utilization of the machine capacity. Likewise optical instruments can be attached for accurate alignment and centering.

An inside view is also shown of an automatic attachment for changing feeds on a copying lathe using buttons to close electrical circuits. The diagram permits one to follow the sequence of operations. Another diagram covering operation of a French made thread-cutting machine depicts the application of carbide tools to thread cutting. The machine works automatically, roughing and finishing the threads in sequence.

A duplex circular saw is discussed where the pendulum motion of the saw is derived from a crank with adjustable throw while pneumatic cylinders are used for control of the feed and clamping of the workpieces. A Swiss made turret lathe is equipped with two four-position worktables operating synchronously and two copying and stop tables with a pneumatic tracer for profiling work and hydromechanical profiling motions of the worktables.

Among chucking and clamping devices exhibited at the Brussels show are mentioned devices which permit one to chuck 18 unmachined workpieces simultaneously for the first machining operation on a grinding machine. Gripping fingers are used in another such device working from the periphery towards the center of the workpieces to be face-milled. The article is illustrated with numerous diagrams showing many details of the operation cycles of the machines and of the means to obtain them.

### Cutting Edge Temperatures

Numerous research projects have been undertaken to determine temperatures at the cutting edge for various speeds, feeds, rate, depth of cut, work material, tool material, tool geometry, cutting fluids and similar factors which affect cutting temperature and tool life.

A new contribution has recently been published by G. Vierende in the November 1953 edition of the magazine *Werkstatt und Betrieb*. He comes to some conclusions of a controversial nature but of substantial interest to the tool engineer. Among them is the statement that cutting fluids can be effective only at relatively low cutting speeds or when the cutting fluids can be brought into the immediate vicinity of the shear plane and are able to reduce the temperature considerably. He disregards the lubrication effect which—in the opinion of many tool engineers—contributes greatly to the effect of cutting fluids.

The author comments on the fact that

in practical use of carbide tools cutting fluids are seldom employed because no substantial improvement is obtained. He concludes that this is so because the cutting speeds are so high that the time interval is too small for an effective heat dissipation. He has run tests using high velocity cooling, low temperature cooling and evaporation cooling on various materials with the result that the temperature at the chip-tool interface was still about 1300 F even though the outside temperature of the chip (that is at the surface remote from the tool) was cooled to 32 F.

The report covers 13 printed pages with discussion of the relationship between temperature and tool wear, effective cooling of the cutting edge, temperature in the shear plane and in the chip, frictional heat in the tool, temperature of the work surface, energy dissipated into the workpiece and many other items. The author has, however, failed to consider the effect of negative rake angles where the ratio of frictional force to normal force enters in such a way as to make it possible to use cutting fluids on carbides effectively.

#### Load Indicators for Machine Tools

Indicators incorporated into machine tool frames are used increasingly according to an article by O. Kienzle in the December 1953 issue of *Maschinenbau und Werkstattstechnik*. He describes such instruments that utilize the elasticity of the frames and thereby give a measure of the force and stresses existing at a typical point in the machine. As example, in presses, the elongation of the front wall is measured between two points that move with respect to each other. This motion is magnified by a linkage system and can be read from a dial indicator at the front of the machine. Similarly hydraulic load indicators are used on shears, preventing an overloading of the machines where the maximum safe load is marked by a red line on the dial. In addition to training machine operators in the significance of the safety load these measuring devices are also used for determining whether or not the capacity of the machine is properly utilized in order to prevent breakdowns and production losses. Conclusions as to the efficiency of a forging job or a press can also be drawn, supplying the tool engineers with data for improving the methods.

Construction is under way on an aluminum fabrication plant in Alicante, Spain. Owner is Aluminio Iberica, S. A., a company formed about two years by Aluminum Limited of Canada and Spanish interests in view of the potential of the Spanish market.

## TO MEET THE COMPETITION OF NEWER MACHINE TOOLS...



"Eight hours grinding time, required for finishing 4 diameters in a step roll, was cut to 6 hours by changing to Lusol. And we improved the finish."

"Pieces would come off that milling machine stinking hot with oil and you couldn't see across the room for smoke. Look how we're hogging that metal now with Lusol, yet the work stays cool."

"Best previous results were 350 surface feet per minute. We changed to Lusol and the lathe was speeded up to 800 sfpm. Tool life increased 300%."

Old machine tools often set new records when Lusol all-chemical coolant is installed. It gets right to the point where cutting is being done, carrying off the greater heat that's generated at higher speeds and feeds. Tools stay sharp longer, reducing down time and making dimensions easier to hold.

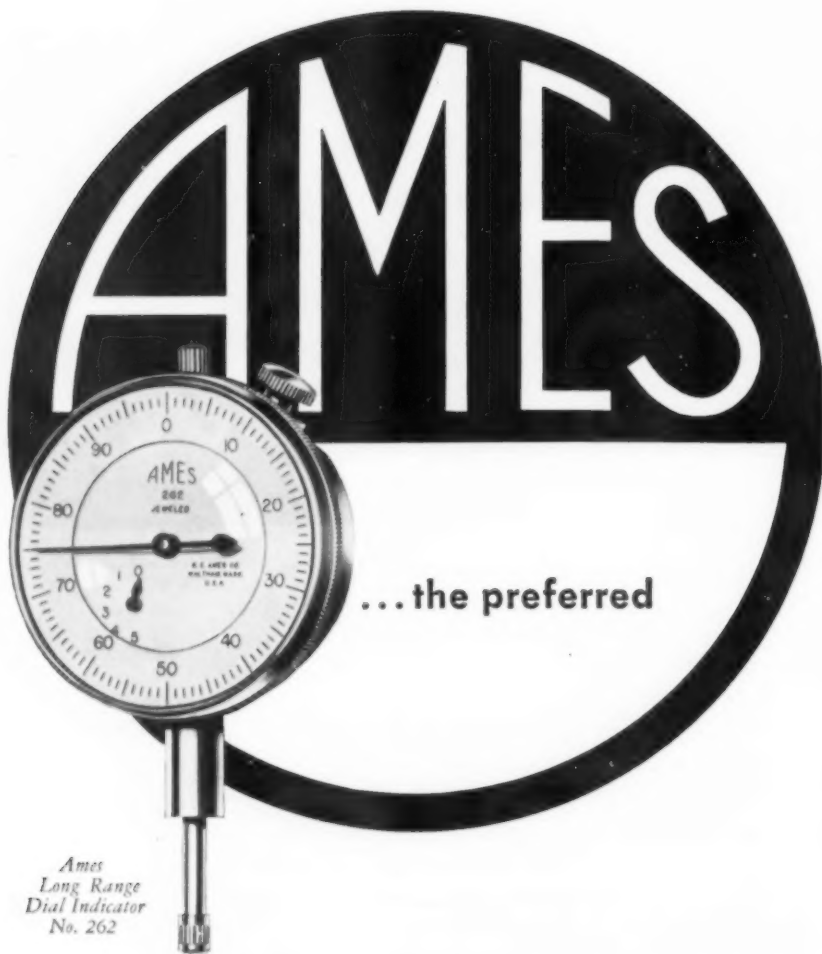
Users of Lusol credit this coolant with production increases of 50% to 500%. To determine what it will do in your old and new machines, test Lusol in your own plant. We'll help you clean out a machine and get the test started.

**FREE BOOKLET**—Write for this help and the booklet, *Lusol Gets to the Point*. It describes the use of Lusol and how it is performing in various types of metal working machines. F. E. Anderson Oil Company, Inc., Box 213-V, Portland, Connecticut.




**ALL-CHEMICAL  
METAL WORKING  
SOLUTION**

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...the preferred

Ames  
Long Range  
Dial Indicator  
No. 262

... not because they cost more (in the long run they're more economical) but because they're completely *impersonal*. They do their measuring jobs absolutely independent of the human hand.

For more than 50 years, Ames Micrometer Dial Gauges and Indicators have kept pace with increasingly critical precision requirements. Today, each part of every Ames product is carefully built by exclusive Ames methods and machines from the materials best suited to its function — and 100% checked for accuracy. As a result, all Ames products are extremely accurate and sensitive, yet rugged and tough — to give you *longer* service with less down-time.



Ames Dial  
Comparator No. 13



Ames Caliper  
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**PRINCIPLES OF AUTOMATIC CONTROLS** by Floyd E. Nixon, Published by Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. Price \$9.35. 409 pp.

This book's basic aim is to give readers an understanding of various principles used in designing automatic control systems. Discussed are all aspects of linear system design, transient response, frequency response, stability criteria, numerical integration, automatic computers and transient analysis.

Among the topics discussed are: application of mathematics to control systems, the Laplace transformation integral, the Nyquist criterion, and automatic computers.

**DYNAMICS AND THERMODYNAMICS OF COMPRESSIBLE FLUID FLOW** by Ascher H. Shapiro, Published by The Ronald Press Co., 15 E. 26 St., New York 10, N. Y. Price \$16.00. Vol. 1. 647 pp.

This book presents a comprehensive treatment of compressible fluid mechanics. Analytical developments comprise two types of coverage: those leading to design methods and those dealing with exemplary methods. Although they are not in themselves suitable for the engineering office, the examples which they permit to be worked out often provide important information about the behavior of fluids in typical situations. Thus they serve as guides to the designer in solving problems where design methods are not sufficient.

**INFORMATION THEORY** by Stanford Goldman. Published by Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. Price \$9.00. 385 pp.

The primary objective of this book is to present a thorough discussion of the principles of information theory. The author presents basic and general aspects at a sufficiently elementary mathematical level intelligible to readers in the non-math sciences and interested in information theory.

A few of the subjects discussed in this book are: information theory of discrete systems, some properties of continuous signals, ergodic ensembles and random noise, the entropy of continuous distributions, and various aspects of information theory.

**PARTIAL DIFFERENTIAL EQUATIONS IN ENGINEERING PROBLEMS** by Kenneth S. Miller. Published by Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. Price \$9.00. 254 pp.

The subject of partial differential equations is treated in this book at a level which can be appreciated and used by engineering students. Practical solutions of partial differential equations is given with little attention to existence, uniqueness, and convergence.

Presented in various parts of the book are the Fourier series, Legendre's, Bessel's, and Mathieu's equations and functions. Other subjects covered are: derivation of partial differential equations, separation of variables, and properties of second-order partial differential equations.

### MANUAL OF MATHEMATICS

Published by Lefax, Ninth and Sansom Sts., Philadelphia 7, Pa. Price \$4.25 six ring binder, two ring binder \$2.25. 334 pp.

Among the five celluloid-tabbed indexed sections of this manual are included the following subjects: mathematical reviews, logarithmic tables, natural trigonometric functions, conversion tables, and functions of numbers. Mathematical reviews contains over 200 equations in brief but thorough reviews of algebra, analytical geometry, trigonometry, and differential and integral calculus.

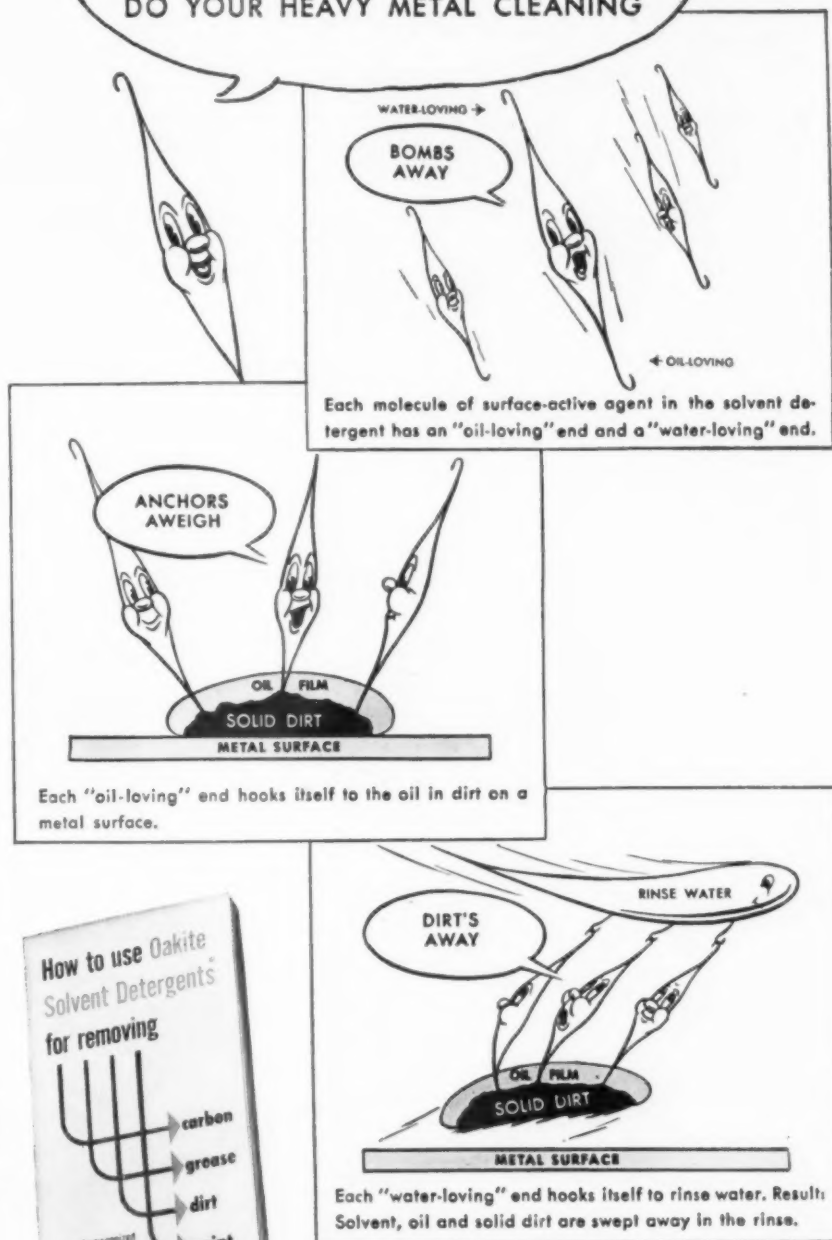
Loose-leaf bound in 3 $\frac{3}{4}$  x 6 $\frac{3}{4}$  in. paper, the handbook is ideal for engineers, surveyors, draftsmen, and students. Additional data can be added anywhere in the manual without disturbing its arrangement.

**MATHEMATICAL METHODS FOR SCIENTISTS AND ENGINEERS** by Lloyd P. Smith. Published by Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. Price \$13.35. 453 pp.

Offering a range of mathematical methods employed in solving technical problems of scientists and engineers, this book illustrates conditions under which these methods are used.

The precise statement and functional grouping of all methods covered makes the book understandable to anyone who may lack the analytical and technical background of a mathematician. Although the author furnishes more than an adequate amount of mathematical material, he excludes differential equations due to the great amount of material to be presented.

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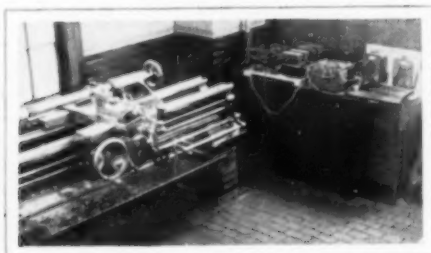
## Now...Picture These Advantages for Your Tools and Dies!

**Make this 3-Minute Check... Discover what has been put into a dependable die steel to help you get better die performance, lower costs!**

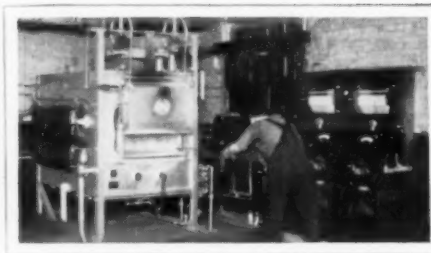
Improving existing die steels and developing new ones to meet the need for lower production costs, has been a challenge met by Carpenter. The results are modern die steels that heat treat and machine

easier to save time and money; run longer between grinds to reduce unit costs. Here are facts about *Stentor* (Oil-Hard) Die Steel—one of 12 modern steels in Carpenter's well-known Matched Steel Check what *Stentor* offers... compare it point by point with the die steel you now use. We believe you'll agree: Here is a real opportunity to put your tooling ahead of competition, take a big step to high quantity output at reduced unit costs.

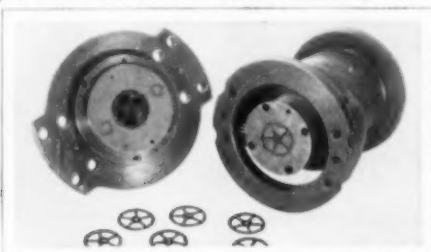
Here is what *Stentor* gives you... **COMPARE** it with the die steel you use...



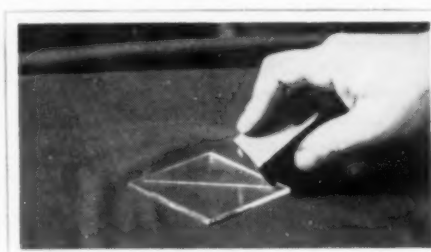
**Easy Machinability.** Two steels were put through this machining test. One, a well-known oil-hardening tool steel; the other, *Stentor* with its simplified analysis. Bars tested were 3 1/2" rd. with same Brinell hardness and structure. Result: With a cut .020" deep, *Stentor* proved to be 11% easier to machine than the other steel. Does the steel you use provide this *extra economy* in machining?



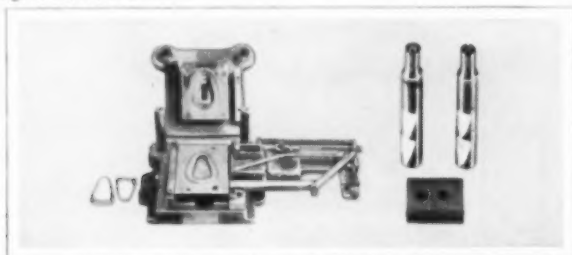
**Simplified Heat Treating.** Because of *Stentor's* simplified analysis, it hardens from the low temperature of 1420° to 1450°F. This low temperature reduces dangers of size change and decarburization—holds warpage to an absolute minimum. How does the steel you use compare with this?



**Safety and Accuracy in Hardening.** This punch and die blanks 1.342" dia. timing mechanism gears having 120 teeth/90 pitch, made from 24 ga. 3/4-hard brass. Customer reports: "In heat treatment the *Stentor* die moved only .0005" on the max. dia. of the gear!" If the oil-hardening steel you use doesn't behave like this, it's time to change to *Stentor*!



**Freedom from Decarburization.** Here is a *Stentor* part as quenched and before drawing, showing absence of soft skin. This test proves that *Stentor* tools when properly hardened are hard enough, right on the surface, to scratch glass! Does the steel you use give you this positive freedom from decarb?



**Full Dependability in Service.** Here are just two examples of the job *Stentor* does day after day in service. Die on left gave 83 continuous hours of production between grinds compared to 10 hours with a chrome-tungsten grade! The 1 1/4" dia. punches shown to right above punch 1/4" thick SAE 1020 steel. After *Stentor* was used production went up 160%. How much *more* output could you add to your total with *dependability* like this?



If you are not getting *all* of these advantages from the steel you use, you're missing a big opportunity to cut costs, raise output!

change to *Carpenter*

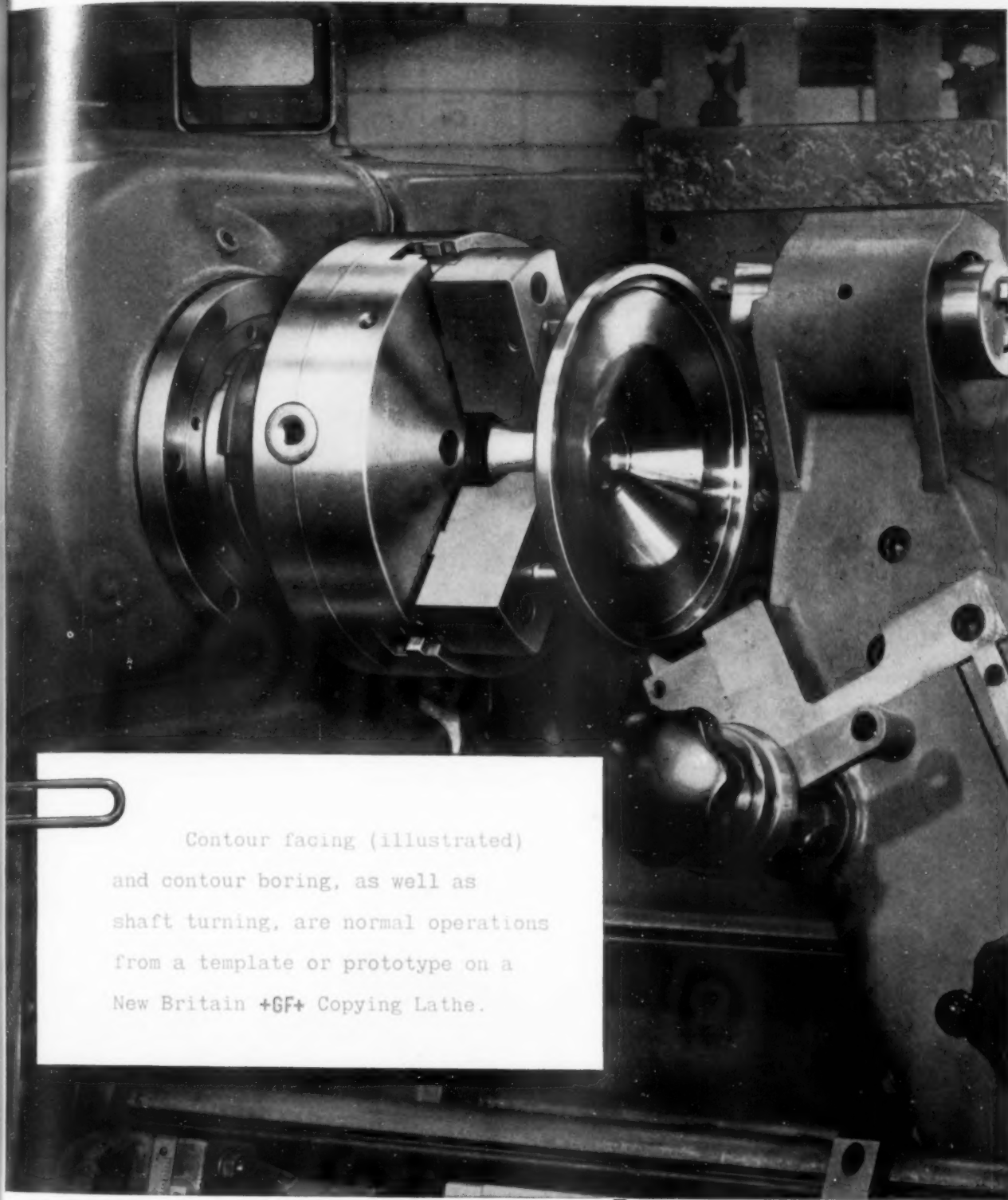
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and contour boring, as well as  
shaft turning, are normal operations  
from a template or prototype on a  
New Britain +GF+ Copying Lathe.

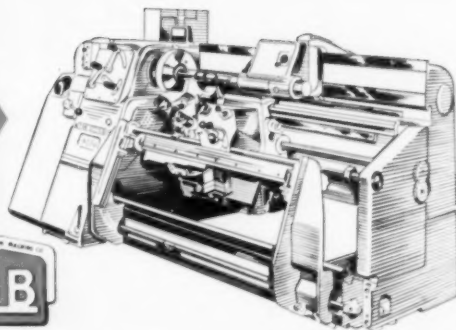
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# FOOTBURT

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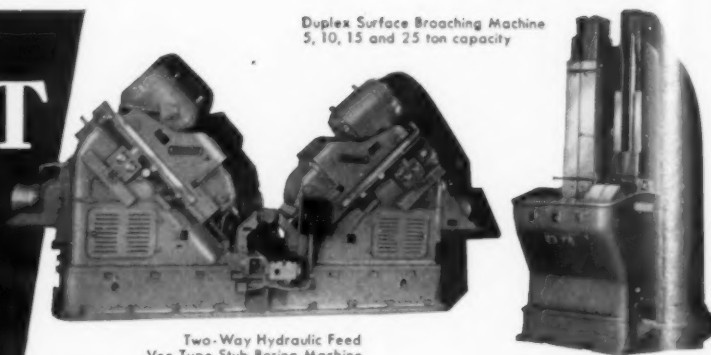
● Way Type Drilling, Boring, Reaming, Tapping and Milling Machines with One, Two or More Ways . . . Station Type Machines . . . Center Column Type Machines . . . Cylinder Boring Machines . . . Inverted Drilling Machines . . . Surface Broaching Machines . . . Sensitive Drilling Machines...Hammond Radial Drilling Machines . . . Manufacturing Type High Duty Drilling Machines . . . Independent Feed Drilling Machines . . . Special Machines.

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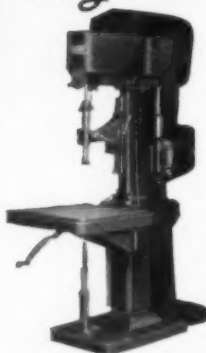
Five Way 21 Spindle Lead  
Screw Tapping Machine



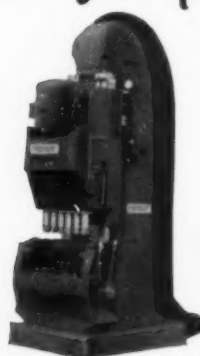
Duplex Surface Broaching Machine  
5, 10, 15 and 25 ton capacity

Two-Way Hydraulic Feed  
Vee Type Stub Boring Machine

*engineered for production*



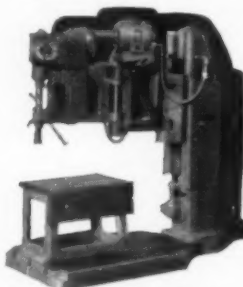
1, 2, 3, 4 and 6 Spindle  
Sensitive Drilling Machines



Stub Type Cylinder  
Boring Machines



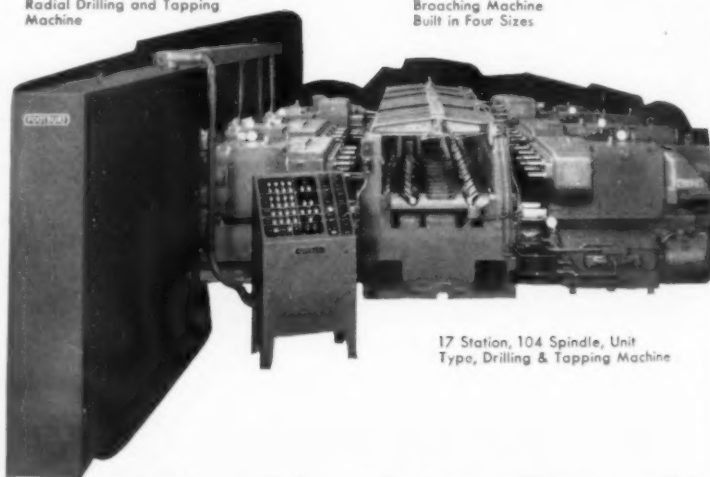
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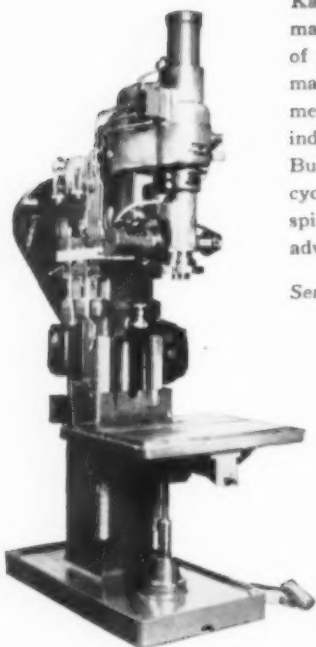
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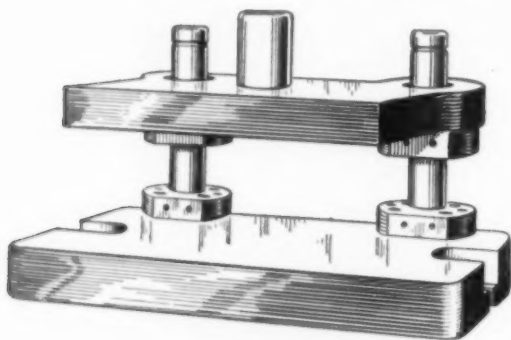
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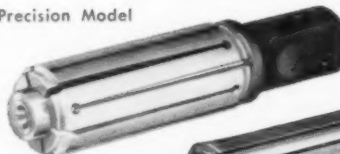
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Precision Model



Standard Model



give  
speed to  
every set-up

The flexible sleeve, mounted on tapered arbor, expands automatically to fit the hole. Inserted by hand — no arbor press needed. Always an exact, positive, concentric fit. Locked by a single mallet blow. Unlocked the same way. CHAMPION Expanding Mandrels are used in machine shops around the world. Save time, cut production costs, whether the job calls for machining one piece or a thousand.

**Precision Model** has expansion range of .010". Available in regular sizes to fit holes from 1/2" to 3" diam. Holds work to tolerances of .0002" run-out. Guaranteed for precision grinding, turning and milling operations.

**Standard Model** maintains close tolerances, handles material of any length bore, hard or soft metals — from thin tubes and bushings to heavy castings and forgings. A set of fourteen will fit every hole from 1/2" to 9 1/2" diam.

CHAMPION Expanding Mandrels can be made in special shapes and sizes to fit any specifications. Quotations on request. Write for descriptive folder today.

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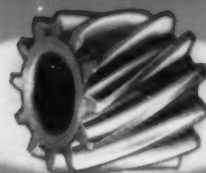
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# GEARS SHAVED in 12 to 20 SECONDS

Finishing precision gears to close tolerances on tooth profile, index, eccentricity and tooth surface smoothness on Red Ring Shaving Machines is a high production operation as indicated by these random examples.



**A** SHAVING TIME 16 SECONDS



**D** SHAVING TIME 12 SECONDS



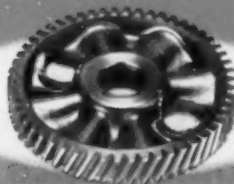
**B** SHAVING TIME 16 SECONDS



**E** SHAVING TIME 15 SECONDS



**C** SHAVING TIME 20 SECONDS



**F** SHAVING TIME 20 SECONDS

## GEAR CHARACTERISTICS

Gear	Stock Removed Over Pins	Material	No. of Teeth	PD	DP	Face Width
<b>A</b>	.010"	Steel	19	2.4"	9.25	3/8"
<b>B</b>	.010"	Steel	29	4.00	9.25	1 1/4"
<b>C</b>	.010"	Cast Iron	28	2 3/4"	10	1 1/4"
<b>D</b>	.005"	Steel	12	1 1/4"	13.5	1"
<b>E</b>	.006"	Steel	14	2 3/4"	6/8	1 1/4"
<b>F</b>	.012"	Aluminum	54	5 3/4"	10	3/4"

WRITE FOR DESCRIPTIVE  
LITERATURE ON  
*Red Ring  
Gear Shaving*

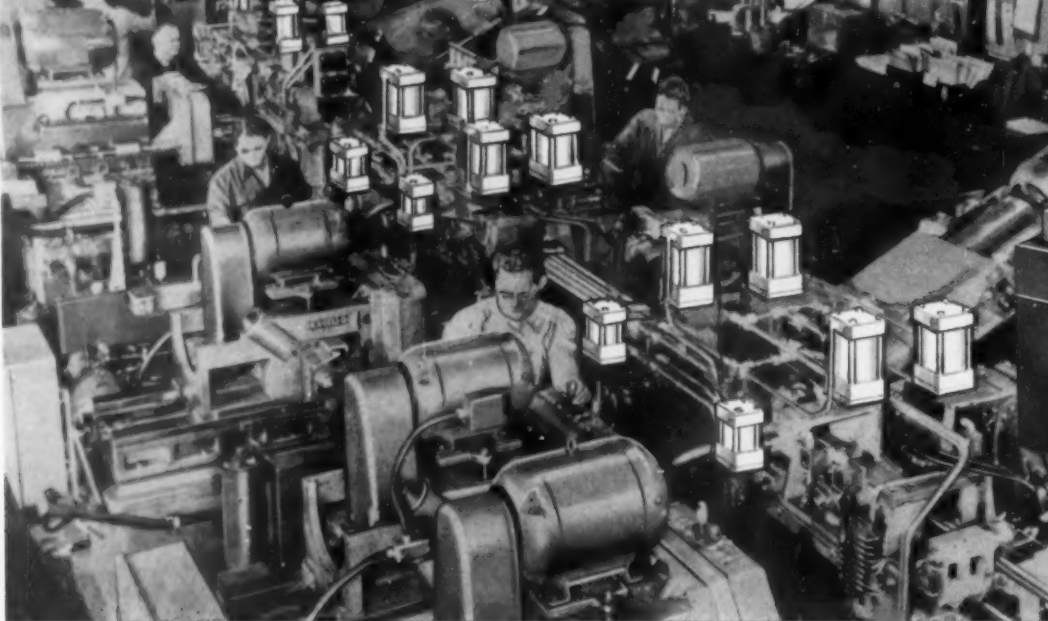
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**...assures non-stop production flow with BIG savings in maintenance and investment cost!**

The production magic of "AUTOMATION" demands faultless performance—as the failure of one important component of "automation" machinery and equipment can shut down an entire manufacturing process.

In the "automation" application illustrated above, 22 Standard Miller High Pressure Hydraulic Cylinders are employed on each of two identical automotive transfer machines built by Ex-Cell-O Corp. of Detroit, Michigan, a recognized leader in the design and manufacture of "automation" equipment.

The machines perform—simultaneously and automatically—drilling, countersinking, counterboring, and tapping operations on automotive cylinder heads. And the Miller Cylinders accomplish the vital clamping, feeding, holding, rotating and locating operations that enable the machines to function as smooth "automation" production units.

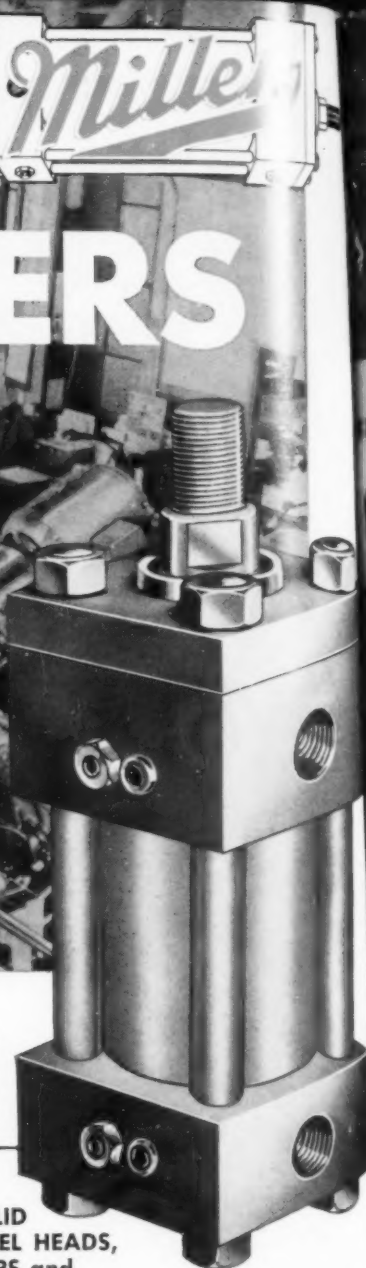
Miller Cylinders are ideal for such "automation" applications. They withstand severest shock loads, provide millions of smooth strokes without repacking of seals or other maintenance. Their space-saving square design cuts installation and designing costs. They're available in an infinite variety of versatile power and stroke units that cover every need and permit the most economical choice for the application. And they fully meet the J.I.C. Standards.

**Consult our engineering department or local representative. And write for complete information on this and other interesting applications and for our FREE Cylinder Bulletins A-105 and H-104.**

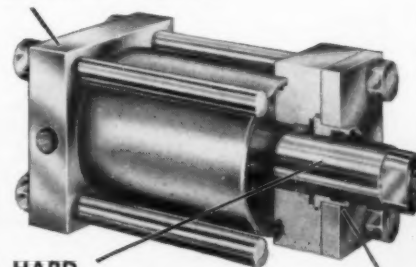


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COUNTERBALANCE CYLINDERS

# Tool Steel Topics



BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Pack-harden Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributors: Bethlehem Steel Export Corporation

## BETHLEHEM TOOL STEEL ENGINEER SAYS: Pack-hardening Tools?

*It's Best to Use  
a Thermocouple*

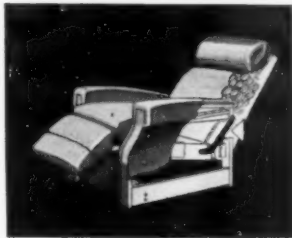


shops which do not have controlled-atmosphere furnaces, you will sometimes find it desirable to pack-harden the tools, to avoid both excessive scaling and carburization.

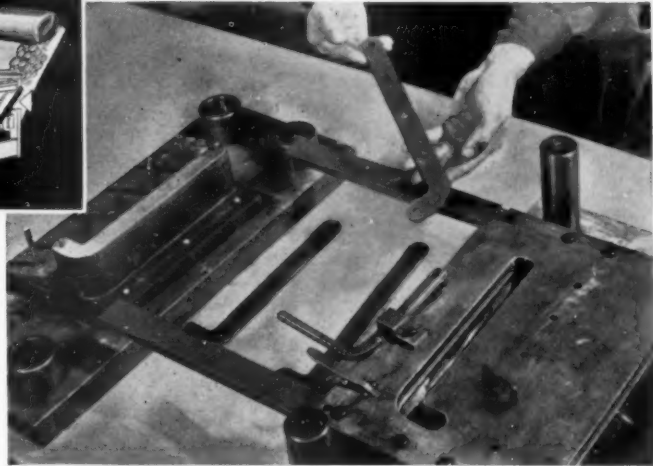
This can be accomplished by packing tools in sealed containers prior to heating in the furnace, using protective materials such as cast-iron chips, wood charcoal, or spent carburizing compound. However, in following this procedure, this precaution is important: do not permit any of the tools to come in contact with the container.

Heating through the pack is a slow process at best, and for this reason it is often difficult to make a close estimate of the length of time required for proper heating. We therefore recommend that a thermocouple be inserted in the pack, close to the tools.

After the tools have been heated the proper length of time, they may be removed from the pack, then quenched in the usual manner. If a controlled-atmosphere furnace is not available, pack-hardening should always be used on those steels which have a quenching temperature in excess of 1650 F. This does not hold true, however, in the case of high-speed and hot-work steels.



*Inset (above) shows type of chair in which back hinge is used. The BTR die, together with the hinge, is shown at right.*



## BTR BLANKING DIE MAKES PART FOR MECHANISM OF BARCALOUNGER CHAIR

At the busy plant of Barealo Manufacturing Co., Buffalo, N. Y., they're turning out, among other things, a back hinge which is used in the tilting mechanism of the popular Barcalounger chair.

The operation, performed by a blanking die in a 200-ton press, involves two steps—punching five small-diameter holes in 3/16-in. sheet steel, then blanking the hinge to size. The die, made of BTR, is hardened to Rockwell C58-60. It is giving a good account of itself because of its resistance to the shock encountered. And as for wear, the die is expected to last and last, for with 6000

pieces produced daily, its use is required only periodically.

BTR (Bethlehem Tool Room) is our manganese-chromium-tungsten grade of oil-hardening tool steel, well known for its safe-hardening property.

### Typical Analysis:

Carbon	0.90	Vanadium	0.20
Manganese	1.20	Tungsten	0.50
		Chromium	0.50

If you have a job calling for a safer hardening steel than carbon tool steel—such applications, say, as blanking, cold-forming, and bending dies, forming rolls, and the like—it's hard to beat BTR.

## Lehigh S Increases Life of Burnishing Rolls

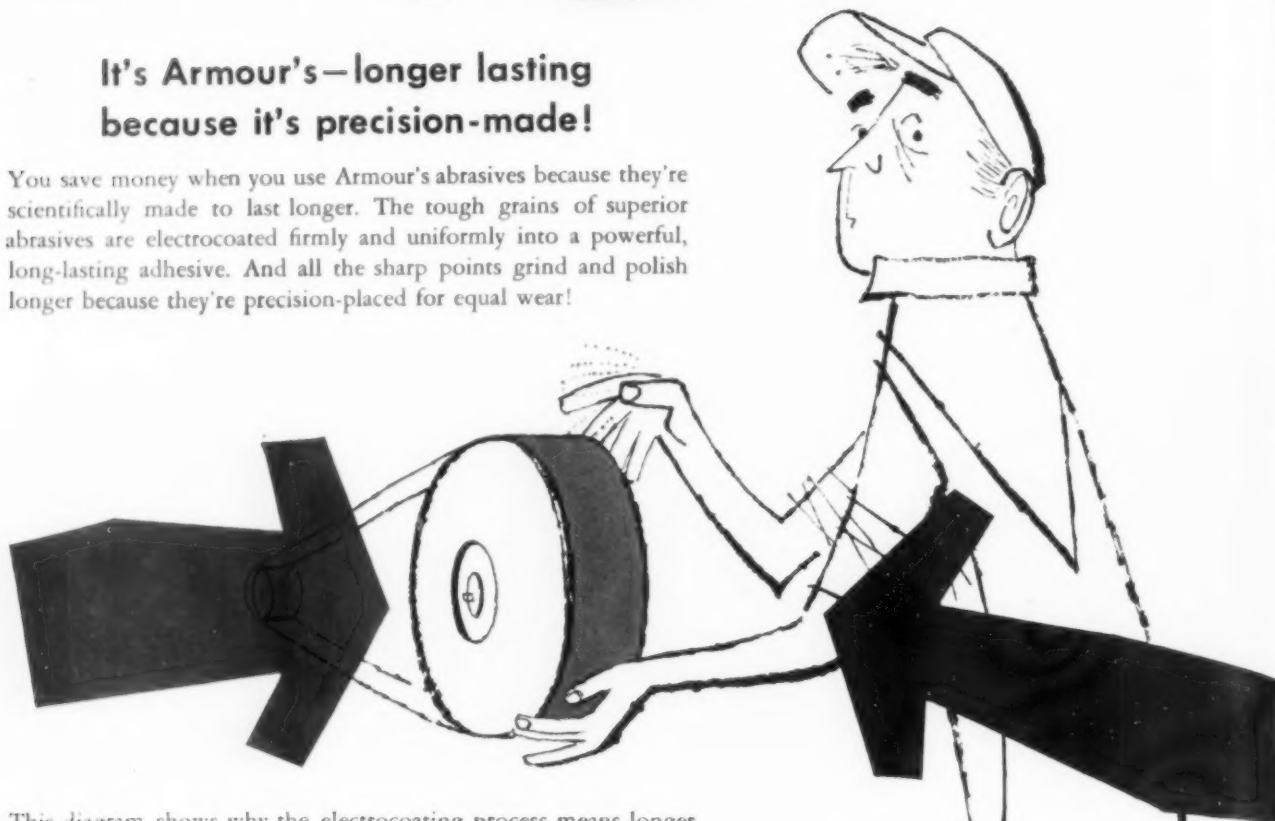
This picture shows the burnishing of a freight car axle to provide a smooth, mirror finish. Two rolls, at right angles to the work and applied with about 400 psi pressure, cold-roll the axle simultaneously. The rolls are made of Lehigh S (our oil-hardening type of high-carbon, high-chromium tool steel), hardened to Rockwell C-62. They burnish 60 axles in 8 hours, and have a service life of about six months. With grades formerly used, the maximum service life was two months.



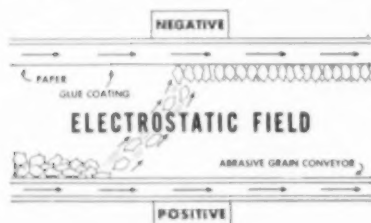
# Don't change that belt!

It's Armour's—longer lasting  
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You save money when you use Armour's abrasives because they're scientifically made to last longer. The tough grains of superior abrasives are electrocoated firmly and uniformly into a powerful, long-lasting adhesive. And all the sharp points grind and polish longer because they're precision-placed for equal wear!



This diagram shows why the electrocoating process means longer life for all of Armour's precision abrasives. Notice how the Armour



grains are attracted to the upper electrode, fixing themselves firmly at right angles to the backing. This gives the abrasive sharper, longer cutting action. It means more production for you at lower cost.

Belts are just one item in Armour's *complete line* of precision abrasives. Alundum, Garalun, Garnet and Crystolon in rolls of paper, cloth and combination, sheets, belts, discs, and other specialized forms are all available to help you solve your abrasive problems. Call your industrial distributor today for Armour abrasives!

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be done."*

You can't drill small  
holes and large holes  
at the same feed and  
speed."



*"Well,  
let's see."*

What do you pay off  
on? Feed? No! Speed?  
No! Production? YES!!  
—on your tooling cost  
and finished parts per  
hour."

## DON'T YOU AGREE?

### EXAMPLE (and it's extreme)

Drill stand has 30 holes  $\frac{1}{16}$ " through  $\frac{1}{2}$ " diameter. Completely drilled in two passes with two Zagar gearless drill heads, 16 spindles per head. All spindles run at 1200 r.p.m.

**Conventional multi-speed method.** So-called ideal speeds would be not less than three times as fast for the  $\frac{1}{16}$ " drill as for the  $\frac{1}{2}$ " drill. Ideal drill feed would be three times as heavy for the  $\frac{1}{2}$ " as for the  $\frac{1}{16}$ ". Moreover, six passes would be necessary.

**Zagar single-speed method.** Only two passes. Feed is held down by strength of  $\frac{1}{16}$ " drill, and speed is held down by  $\frac{1}{2}$ " drill. Simplified operation; fewer indexes; far less handling. Production is at least tripled. Tooling costs drop enormously.

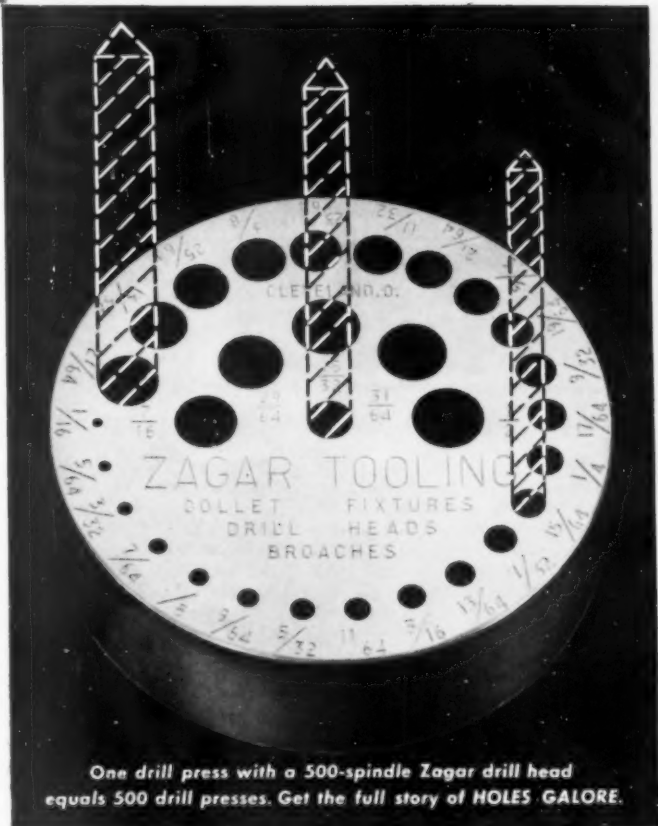
*If you don't agree, what's your version?*

★ ★ ★

WRITE FOR CATALOG "E-3".

## ZAGAR TOOL, INC.

24000 LAKELAND BLVD. • CLEVELAND 23, OHIO



**Zagar**

TOOLS FOR INDUSTRY  
and SPECIAL MACHINERY

# New-

to meet today's  
demand for higher  
accuracy,  
closer  
tolerances...



**It's Accuracy  
Is Built In!**

#### PRE-LOADED BEARINGS

Twin high-precision roller bearings are pre-loaded after center is assembled. Point is then ground in its own bearings. Eccentricity tolerance is limited to plus or minus .0001". All parts are hardened and ground.

#### NEW DOUBLE SEAL FOR LONGER LIFE AND CONTINUOUS ACCURACY

Efficient "Universal" Seal consists of a stationary hycar sealing ring in the cap and a slinger rotating with the point. Hycar ring keeps out dirt, chips and coolant—slinger keeps grease in.

**"UNIVERSAL"**  
**Live Center**  
Accurate to  $\pm .0001$ !  
High Load Capacity for a  
Wide Range of Jobs

**If you use lathes, here is important news!**

Now, with the all-new IDEAL "Universal" Live Center you can have all the advantages inherent in freely turning live centers—higher turning speeds, deeper cuts, freedom from gouging and burning, chatter and center point lubrication—with turning accuracy held to plus or minus .0001". In addition, the "Universal" Live Center gives you the safety of load capacity beyond most normal requirements. This means you can profitably use its greater accuracy for many more jobs and you don't have to pay a premium—the "Universal" is economically priced. Available in Morse Tapers 2, 3, 4 and 5, for work up to 5630 lbs. Immediate delivery, if you order now!

**SOLD THROUGH AMERICA'S LEADING DISTRIBUTORS**

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4152 Park Avenue, Sycamore, Illinois  
Send me catalog data on the new IDEAL "Universal" Live Center.

NAME .....  
COMPANY .....  
ADDRESS .....  
CITY..... ZONE..... STATE.....

USE READER SERVICE CARD; INDICATE A-3-182-1



**Know—don't guess—  
the Hardness of  
your metals...before  
and after machining**

## Ames PORTABLE HARDNESS TESTERS

Show the exact hardness of your metals before and after heat-treating, to reduce tool wear and breakage and to speed up production.

Ames Portable Hardness Testers are light in weight and are carried to the work. Tests are easy to make and accurate, requiring no skill.

Ames Portable Testers are used to test flats, rounds, strip, tubing, wire, etc., without cutting off specimens. Saws, gears, knives and large irregular shapes are tested while assembled. Readings are direct in the Rockwell Scales.

Send today for interesting folder  
"Rockwell Hardness Testing Made Easy"



**AMES PRECISION MACHINE WORKS**  
Waltham 54, Mass., U.S.A.

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The EASY WAY!**

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**COLONIAL  
DRILL JIG BUSHINGS**

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**DEVLIEG OF DETROIT**  
brings you a new  
comprehensive catalog  
featuring—

# Microbore

...the multipurpose single point adjustable tool for precision boring, turning and facing operations.

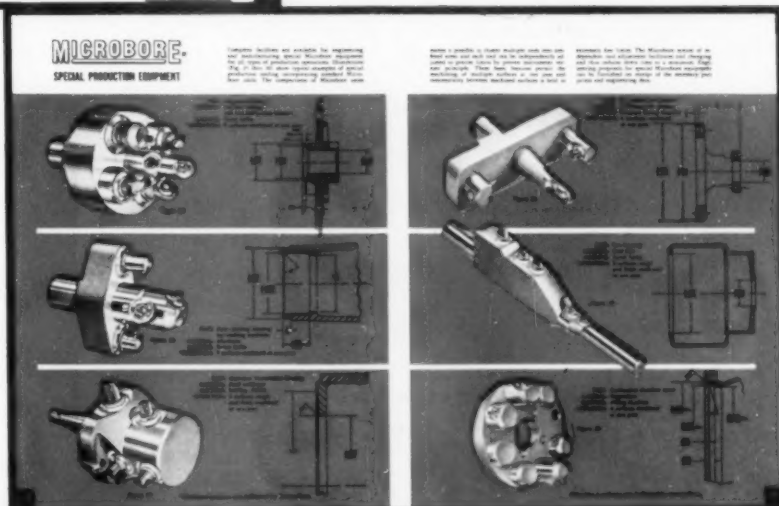


## For General Purpose Work:

A wide range of standard Microbore boring bar sets is available for tool work and general purpose boring.

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A complete service is available for engineering and manufacturing special Microbore equipment for all types of production operations.



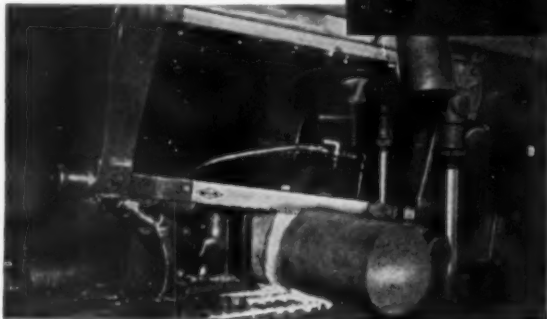
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Every Barnes Power Hack Saw blade is individually Rockwell tested to assure you the fine quality for which Barnes blades are famous.

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A Boring Head that Won't Face is Not Complete

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COMBINED BORING & FACING TOOL HEADS  
**Chandler-Duplex**

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Over 85% of the torque wrenches used in industry are

## STURTEVANT TORQUE WRENCHES

Read by Sight, Sound or Feel

- Permanently Accurate
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- Faster—Easier to use
- Automatic Release
- All Capacities

in inch ounces  
... inch pounds  
... foot pounds  
(All sizes from  
0-6000 ft. lbs.)



Every manufacturer, design and production man should have this valuable data. Sent upon request.

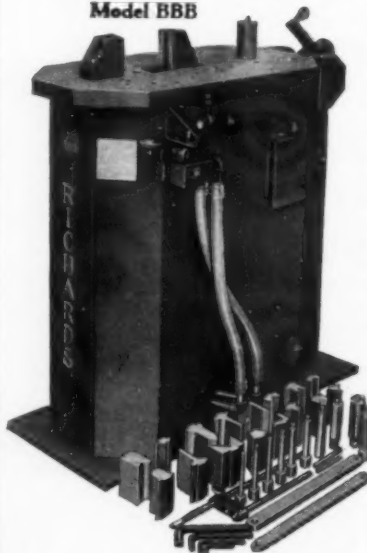
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ADDISON QUALITY ILLINOIS

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## Multiform BIG BROTHER BENDER

Produces Without Special Tooling—Saves Die Costs Saves on Expensive Presses

Model BBB



Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender using the standard tooling.

The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes complete with dies, mandrels and wrenches—punching and blanking dies extra. Will punch holes up to 1" and form material up to 1/4" thick by 4" wide. We also build smaller hand or air operated models for forming up to 1/4"x1 1/4" material.

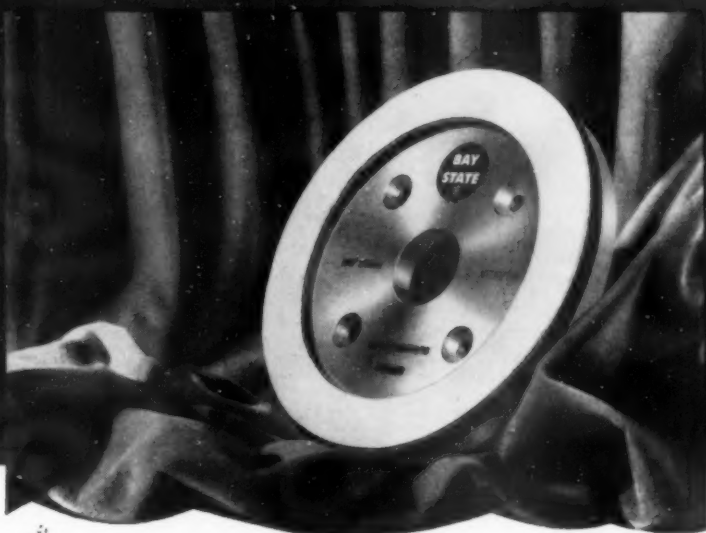
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Kalamazoo, Michigan

**J. A. RICHARDS CO.**

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The Tool Engineer



## BAY STATE DIAMOND WHEELS... For Any "Engagement"!



Engagements, diamonds, and life-time bonds have long been partners. So have BAY STATE, and "Grinding Wheel Progress".

The latest sparkling development is BAY STATE'S new Vitrified bond which holds *every* diamond particle until the last bit of its cutting ability is used.

Results: More uniform cutting rates, greater efficiency per unit of abrasive, still longer wheel-life, and . . . more grinding wheel progress by BAY STATE!

Besides this progressive step in bonds, we have ample stocks of diamond bort, and outstanding abrasive engineering service. Together, these make BAY STATE a most reliable source of all your diamond wheel needs.

Send for new  
Diamond Wheel  
Catalog.



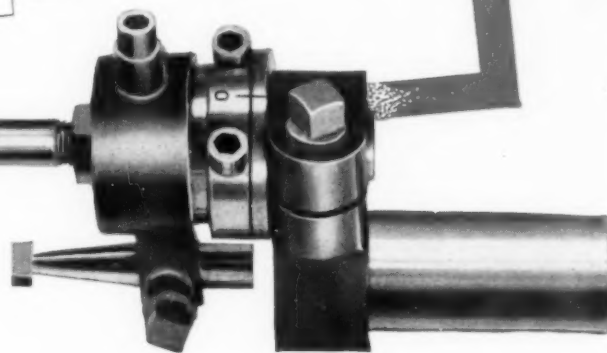
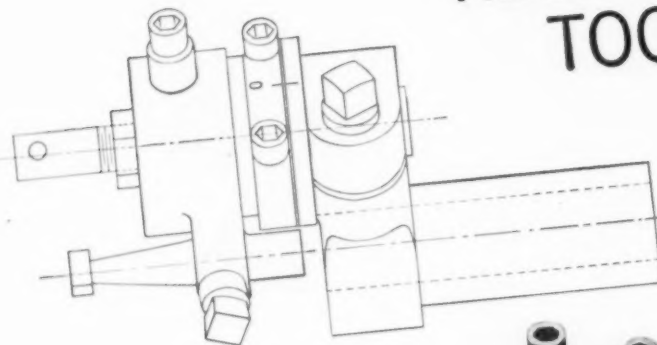
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Branch Offices and Warehouses — Chicago, Cleveland, Detroit, Pittsburgh  
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*Manufacturers of all types of Quality Abrasive Products*

# **NEW** ADDITION TO R and L TOOL FAMILY

## RECESSING TOOL



Newly designed, THE R and L RECESSING TOOL is available in three standard sizes, ( $\frac{5}{8}$ ",  $\frac{3}{4}$ ", and 1" shank). The tool can be adjusted to operate on any internal diameter within capacity of machine . . . also adjustable to operate on outside diameters, (cutting grooves, chamfering, cutting clearance at end of threads, etc.) THE R and L RECESSING TOOL may be operated with spindle running right or left.

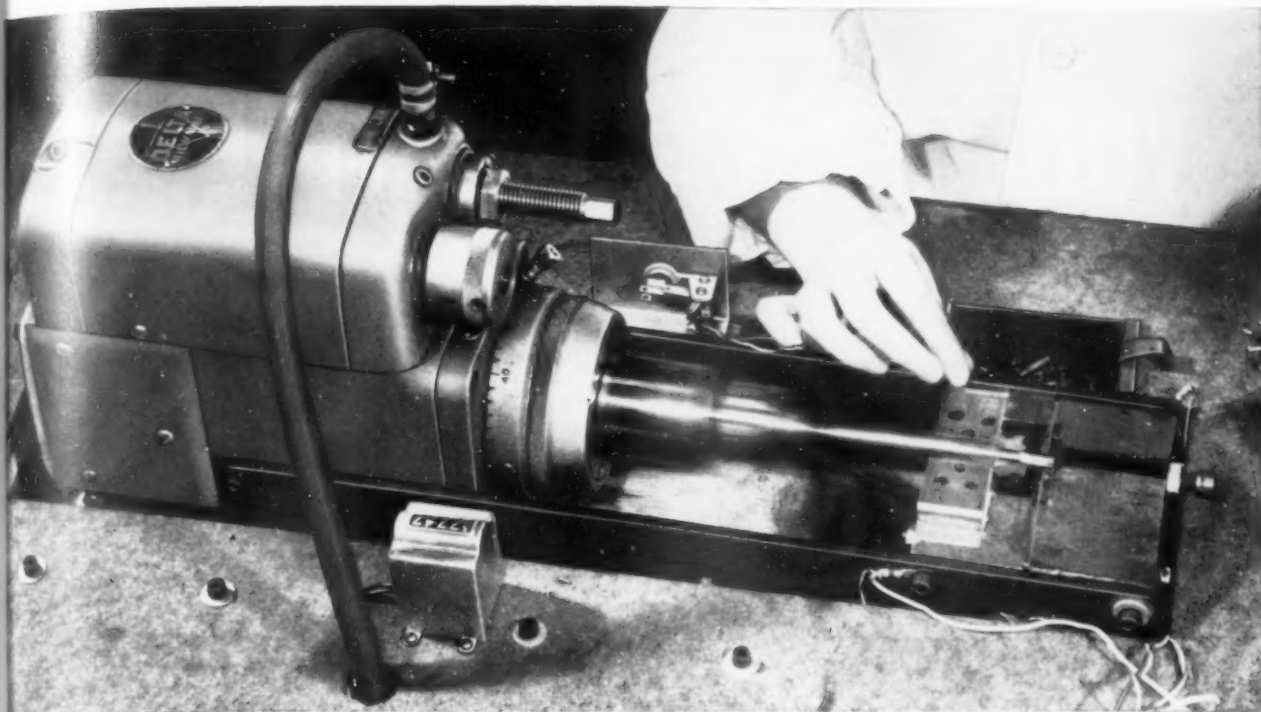
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**R and L TOOLS**

1825 BRISTOL STREET • PHILADELPHIA 40, PA.

TURNING TOOL • CARBIDE OR ROLLER BACKRESTS • RELEASING OR NON-RELEASING TAP AND DIE HOLDERS, (ALSO FURNISHED FOR ACORN DIES) • UNIVERSAL TOOL POST • TURRET BACKREST HOLDER • CUT-OFF BLADE HOLDER  
RECESSING TOOL • REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL

See R and L Tools at Booth No. 134, Industrial Exposition, Philadelphia, April 26-30



## Rockwell\* Air-Hydraulic DRILL UNIT

- ▶ **SAVED \$8,000 IN INITIAL COST!**
- ▶ **SLASHED PART COST 40%!**
- ▶ **CUT PRODUCTION TIME PER PART 79%!**

The Rockwell Air-Hydraulic Drill Unit made possible these very practical results for Radio Receptor Company, Inc., New York City producer of electronic devices. The problem involved the delicate precision assembly of tiny Germanium Diodes, which are rapidly replacing bulkier vacuum type radio tubes in circuits of television sets, electronic computers and radar equipment. Minute tungsten "cats whiskers" had to be "fine squeezed" into sensitive contact with a vertical germanium wafer—with pressure controlled to tolerances of plus or minus .0002"!

Very high rejects and slow manual production methods of this operation started alert manufacturing engineers searching for a better way to do it. Original estimates for equipment were in excess of \$10,000 per machine—and then Radio Receptor engineers investigated the Rockwell Drill Unit.

A single purpose machine—incorporating the Rock-

well Air-Hydraulic Drill Unit—was devised for only \$2,000, an immediate savings of \$8,000! But even more important, production jumped from 2,000 to 10,000 units a day, with rejects cut almost to zero—while cost-per-part was slashed 40%!

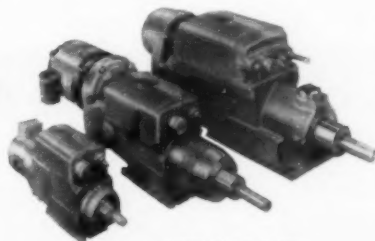
This is just one example—in hundreds of production plants, Rockwell Air-Hydraulic Drill Units have cut costs by cutting waste time, motion and labor out of many varied operations. If you do production drilling, tapping, outside threading, chamfering, hollow milling, counter boring, reaming, centering, or spot-facing, there is a real probability you, too, can make important savings through improved methods, using Rockwell Drill Units instead of conventional machine tools. Let our Authorized Sales Engineer in your area discuss possibilities with you. He not only offers you engineering counsel, but can also demonstrate right in your plant. Send the coupon today for his name.

\*Originally produced by Rockwell under the trade name "Delta."

**Air-Hydraulic DRILL UNITS**



Another Product by **Rockwell**



From 1/3 to 5 hp.

Drill Unit Division  
Rockwell Manufacturing Company  
620B N. Lexington Avenue, Pittsburgh 8, Penna.

☐ Please send name of nearest Authorized Sales Engineer.

☐ Please send me latest Drill Unit Catalog.

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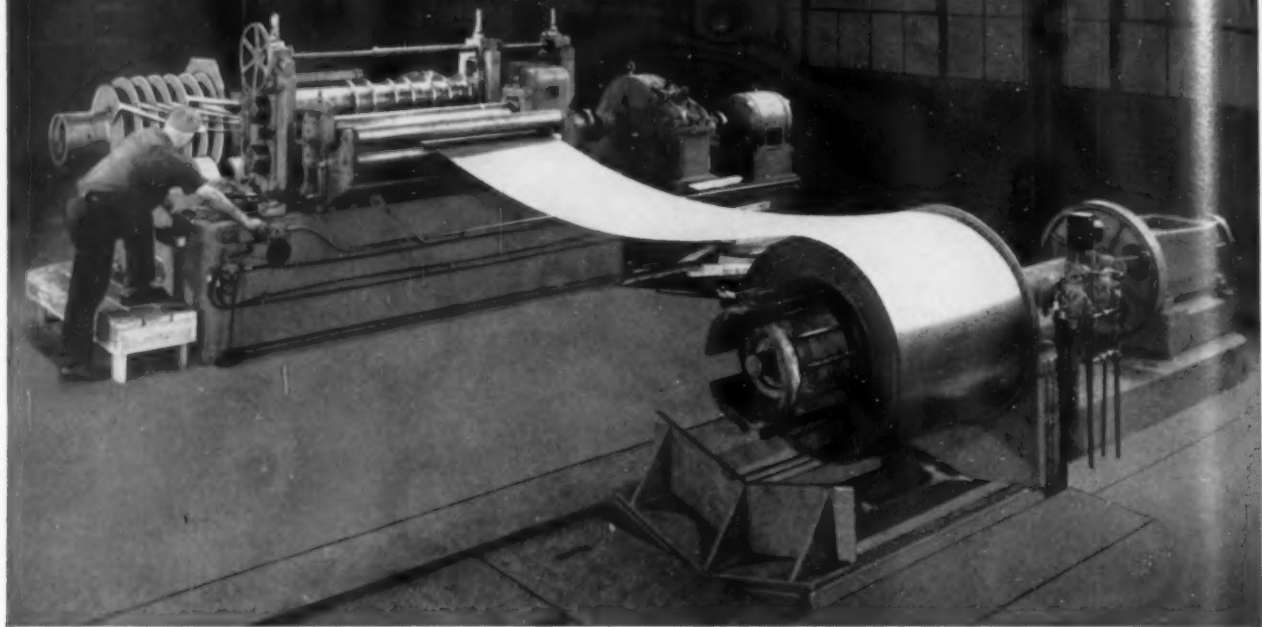
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March, 1954

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-187

187

# YODER *Multiple Rotary* SLITTERS



## *pay Four Kinds of Dividends*

If you use 100 tons or more of coiled strip or sheets per month, in special widths, the installation of a Yoder Slitter will pay four kinds of dividends:

1. Savings of \$10 to \$30 per ton by buying standard widths instead of slit strands. This saving alone often pays for the Slitter investment in a year or less.
2. You can buy standard widths competitively, wherever you can obtain the best quality, price and delivery.

3. Greatly reduced inventory requirements. From a relatively small stock of standard widths you can meet your own needs for special widths in a few hours.

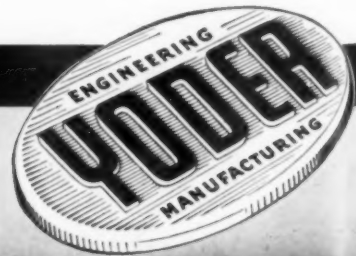
4. Better control of production schedules since slitting service no longer is a problem.

Yoder slitters, uncoilers, recoilers and other accessories are made in many sizes and capacities, from the smallest to the largest. The Yoder Slitter Book is a treatise on the economics as well as mechanics of slitter operation — send for it.

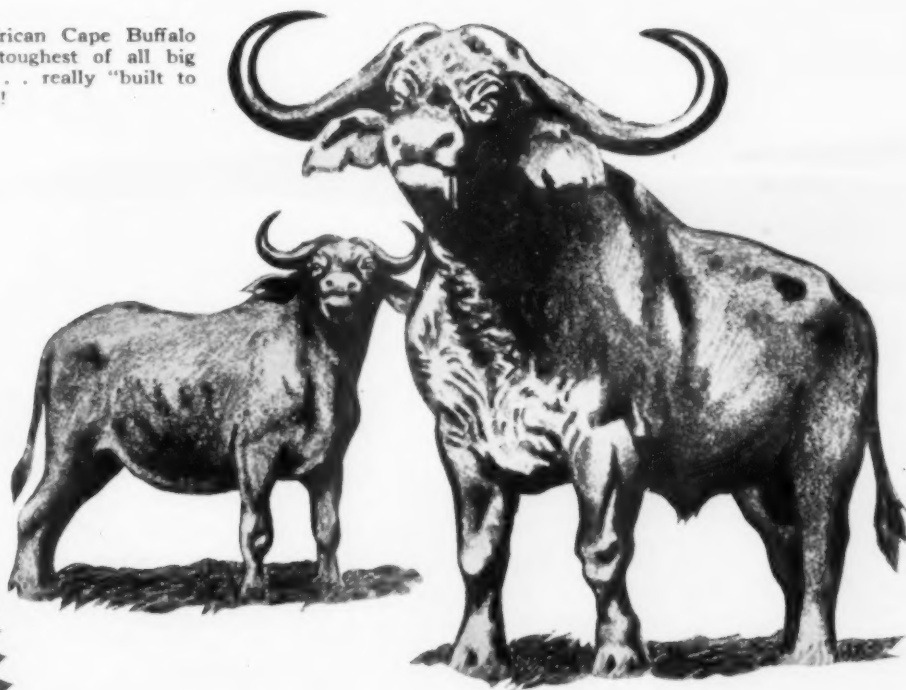
**THE YODER COMPANY • 5525 Walworth Ave., Cleveland 2, Ohio**

### *Complete Production Lines*

- ★ COLD-ROLL-FORMING and auxiliary machinery
- ★ GANG SLITTING LINES for Coils and Sheets
- ★ PIPE and TUBE MILLS—cold forming and welding



The African Cape Buffalo is the toughest of all big game . . . really "built to take it"!



## RUGGED!

Bath Taps are "built to take it" too — during the daily grind of screw machine operation or, on intricate threading jobs that require special handling.

Records prove that a Bath Tap has produced 160,000 malleable iron union ring nuts at a surface speed of 120 feet per minute — that takes "guts" — the kind you need in today's assembly line production.

Rugged Bath Tap performance is dependent on these four essentials:

1. Experienced engineering and design.
2. Best quality basic steel.
3. Heat treating "know how".
4. Controlled methods of procedure.

Anyone can buy steel to specifications — but the real secret of rugged Bath Tap production is in the many years of experience in proper steel selection, heat treating, grinding, finishing . . . in the perfection of every controlled step of manufacture, plus the advantage of exclusive Bath equipment.

For taps that can "take it" — depend on Bath for long life and reliable service. Our representative will be glad to call and discuss your tapping and gaging problems.



Bath engineers check every detail, to see that all Bath Taps are conditioned to do the best threading job for your requirements.

Insist on BATH TAPS for BETTER THREADS

**JOHN B BATH & CO., Inc.**  
22 Grafton St., Worcester, Mass.

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

## How SQUARE HOLED SLEEVES! SPEED UP TOOL-MAKING!



Patents Pending

One of the most difficult problems in tool making can be solved easily and quickly with Sturdy Square Holed Sleeves. The perfection of broached square holes can be had in boring bars, milling cutters and many other applications at a small fraction of the cost of imperfect hand-made square holes. The Sturdy Square Holed Sleeve consists of a round sleeve with a perfectly square hole broached through the center. This hole is tapped at one end to receive a back-up screw which is furnished with the Sleeve. The Sleeve can be sweated or pressed into a drilled and reamed hole to make a perfectly square accurate hole in a very few minutes.



The Sturdy Square Holed Sleeve will save you many hours and many dollars in the making of boring bars, tool holders and other tools requiring square holes.

SLEEVES MADE IN FOLLOWING SIZES:  
3/16, 1/4, 5/16, 3/8, 7/16, 1/2, 5/8, 3/4, 1"

**STURDY BROACHING SERVICE**  
23520 TELEGRAPH RD., DETROIT 19, MICH.

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The **OLDEST** Die Set Manufacturer  
... The **NEWEST** Die Set Design



## RING PUNCHES

**HARD...**  
**tough...**  
**concentric...**

Precision-made of both Carbon Vanadium and high carbon, high chrome steels. Available in a wide range of stock sizes from 1/32" to 1" point diameters in increments of 1/64" for immediate delivery. Decimal sizes to order for delivery within 48 hrs.

### Button Dies

### Ring Type or Press Fit

Hole tapered to eliminate slug jamming. Sizes in stock to match punch sizes.

Write **TODAY** for your copy of handy data sheets covering specifications and prices; also name of distributor in your area.

Exclusive distributor wanted for the states of Washington and Texas.

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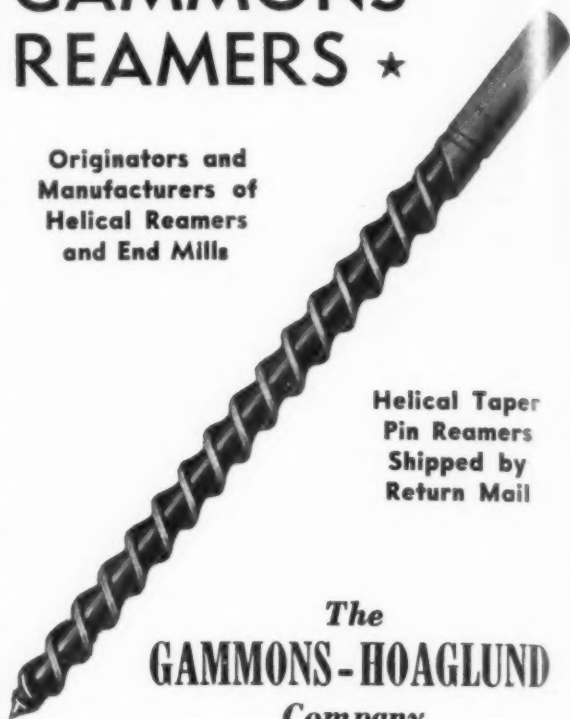
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190

## GAMMONS REAMERS ★

Originators and  
Manufacturers of  
Helical Reamers  
and End Mills



Helical Taper  
Pin Reamers  
Shipped by  
Return Mail

The  
**GAMMONS-HOAGLUND**  
Company

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# Fellows

**MACHINES and TOOLS**

FOR CUTTING

... SHAVING

... BURNISHING

AND INSPECTION

**in GEAR PRODUCTION**

THE FELLOWS GEAR SHAPER COMPANY, SPRINGFIELD, VERMONT

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## DYKEM STEEL BLUE

**Stops Losses**  
making Dies and  
Templates



Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.



Write for sample on company letterhead

THE DYKEM COMPANY  
2303D North 11th St. • St. Louis 6, Mo.

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The Tool Engineer

ASK

# BAIRD

ABOUT IT!

## HIGH PRODUCTION TOOLING

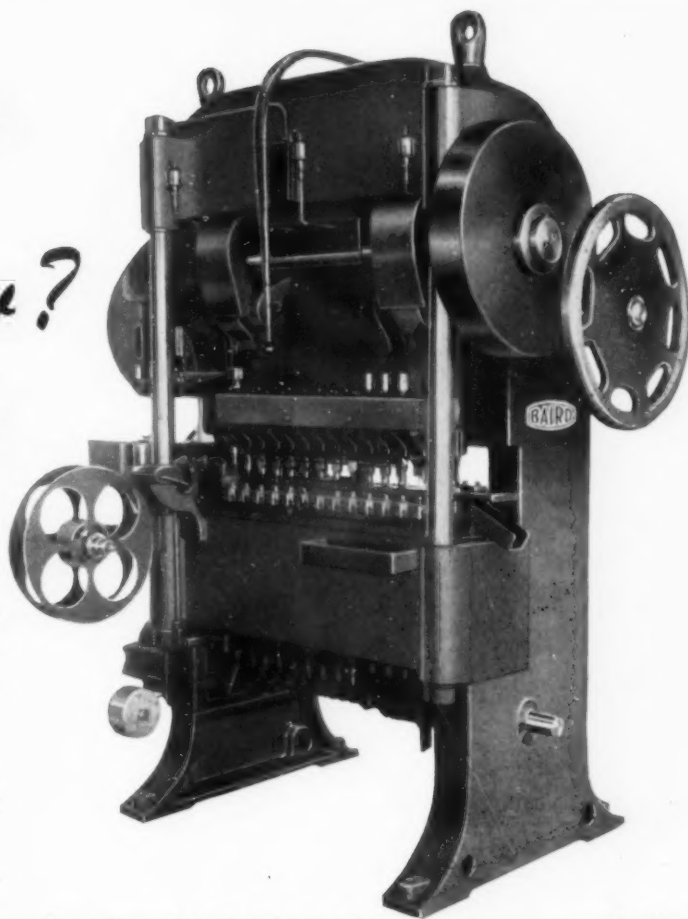
Biting off *More*  
than you can  
*Chew?*

Many types of small stamping machines can bite off coiled metal stock, but the BAIRD MULTIPLE TRANSFER PRESS cleverly chews each length into accurately formed products at the rate of thousands of pieces per hour.

Almost-human transfer fingers automatically grip and carry the work to progressive die stations where blanking, drawing, piercing, embossing, slitting, trimming, broaching, sizing, hexing, forming, etc., complete the piece.

Simply stated, the Transfer Press combines, in a single cycle, operations that otherwise might require several smaller machines with an operator for each. There are almost endless tooling possibilities . . . set-ups that turn out millions of small parts at extremely low cost.

An installation of Baird Multiple Transfer Presses puts the buyer in a most favorable competitive position in a buyer's market. Better "ask Baird about it!"



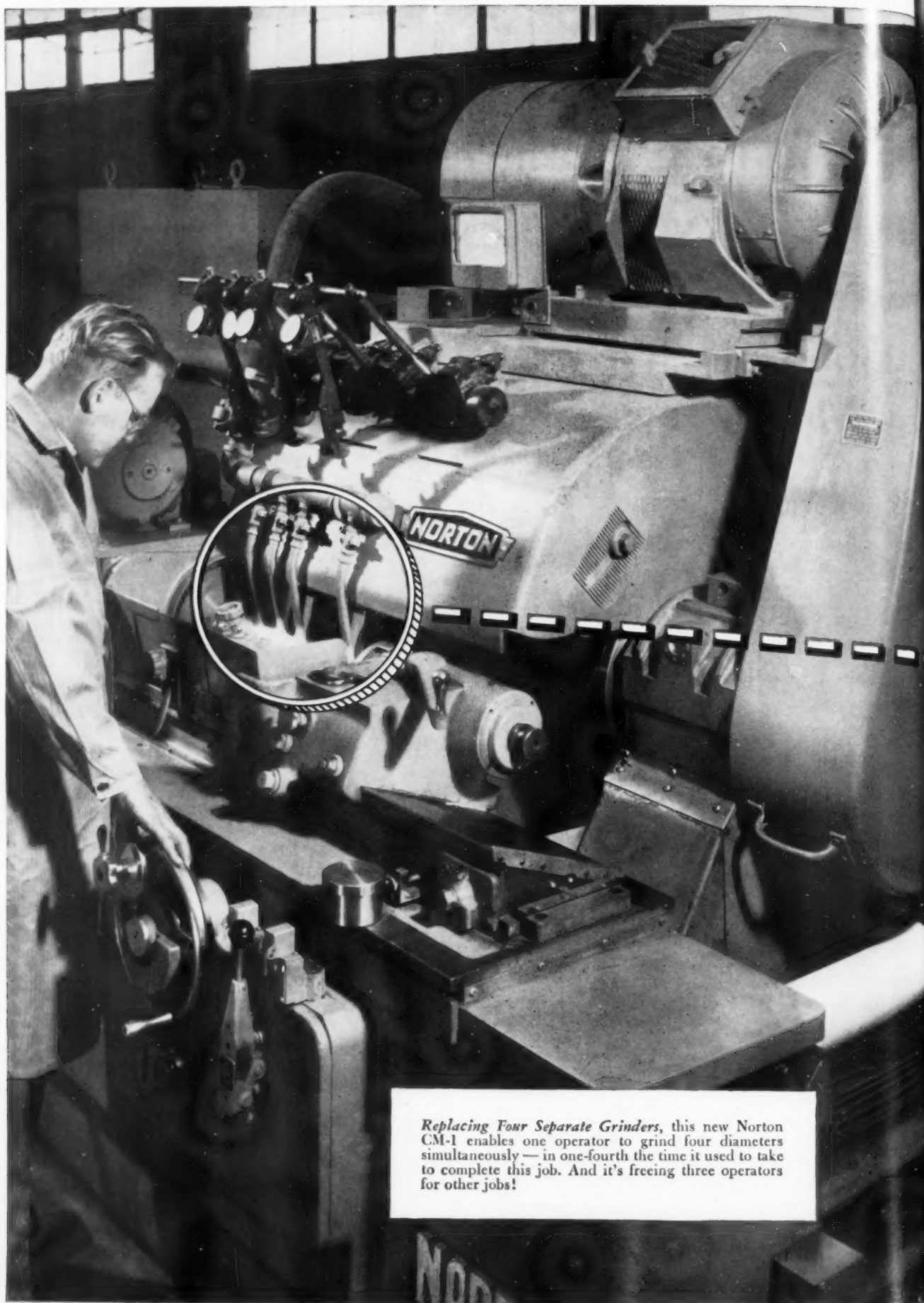
Front view of the Baird Multiple Transfer Press . . . standardized in 12 sizes with rated working pressures from 5 to 55 tons. Coiled stock from 2½" to 4" in width is automatically fed at high speeds.

SEND FOR TRANSFER PRESS BULLETIN

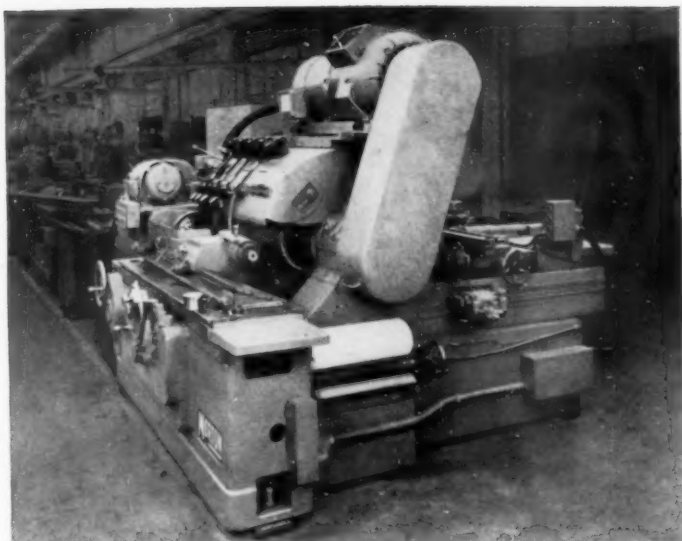
OBASS

*the* **BAIRD MACHINE COMPANY**  
STRATFORD • CONNECTICUT

**AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING  
MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS**



*Replacing Four Separate Grinders, this new Norton CM-1 enables one operator to grind four diameters simultaneously — in one-fourth the time it used to take to complete this job. And it's freeing three operators for other jobs!*



*A Great New Production Tool. The Norton Type CM-1 Heavy Duty Semi-automatic Multi-Wheel Grinder brings new efficiency and economy to the grinding of parts having multi-diameters—such as crank and camshafts, transmission and motor shafts, etc.*

## Here's a new Norton Grinder to boost your production rate



*Type CM-1 Heavy Duty Multi-Wheel Grinder  
does four or more jobs at once, reduces capital  
investment, cuts operating time and costs*

When you can get one machine that does the work of several, in a fraction of the working time, you save considerably on purchase costs, on operating costs, and on floor space.

That machine is now ready to go to work for you. The new Norton CM-1 makes four or more cuts in a single plunge-grind cycle, operating automatically under one-lever control. And it completes each separate grinding operation with the accurate, trouble-free performance that's built into every Norton grinding machine.

### *Typical Advanced Features*

- Cartridge type bearings at each end of heavy, 12"-diameter wheel spindle assure extreme rigidity of spindle, longer wheel life, greater accuracy and control with minimum truing.

- Automatic truing device—in rear, out of operator's way—trues straight or formed wheels each individually, yet all at once, thus requiring only the amount of time needed to true widest wheel.

- Automatic compensation for collective wheel wear, including amount trued off. No adjustment or resetting of wheel needed after truing.

- Optional equipment includes built in automatic sludge remover and coolant filter, constant peripheral wheel speed control, increased power for wheel or work drive, etc.

Why not get the complete story of how the CM-1 can benefit your grinding operations? See your Norton Representative, or write us direct. And remember: only Norton offers you such long experience in both grinding wheels and

machines to bring you the "Touch of Gold"—to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5.

**To Economize, Modernize With NEW**



**GRINDERS and LAPPERS**

*Making better products...  
to make other products better*

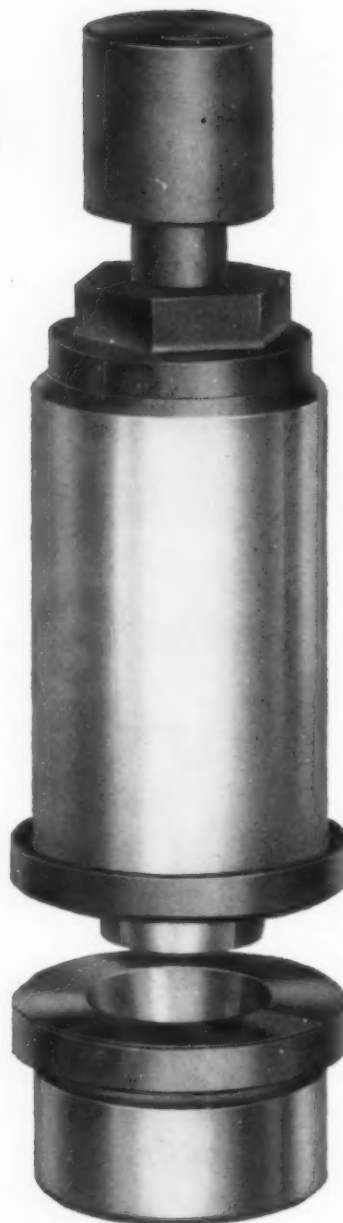
District Sales Offices: Hartford • New York  
• Cleveland • Chicago • Detroit

# STANDARDIZED UNIVERSAL INDEX PLUNGERS

**SAVE TIME  
SAVE MONEY**

Universal's Straight and Taper Plungers made in standard sizes save the time and expense of designing and machining special index plungers for multi-station tools. They come to you complete, ready for installation at approximately  $\frac{1}{4}$  the cost of specially made plungers.



Universal Plungers greatly simplify jig or fixture manufacture because plunger body and bushing have same diameter so that all holes can be bored with same tool, often in same setting.

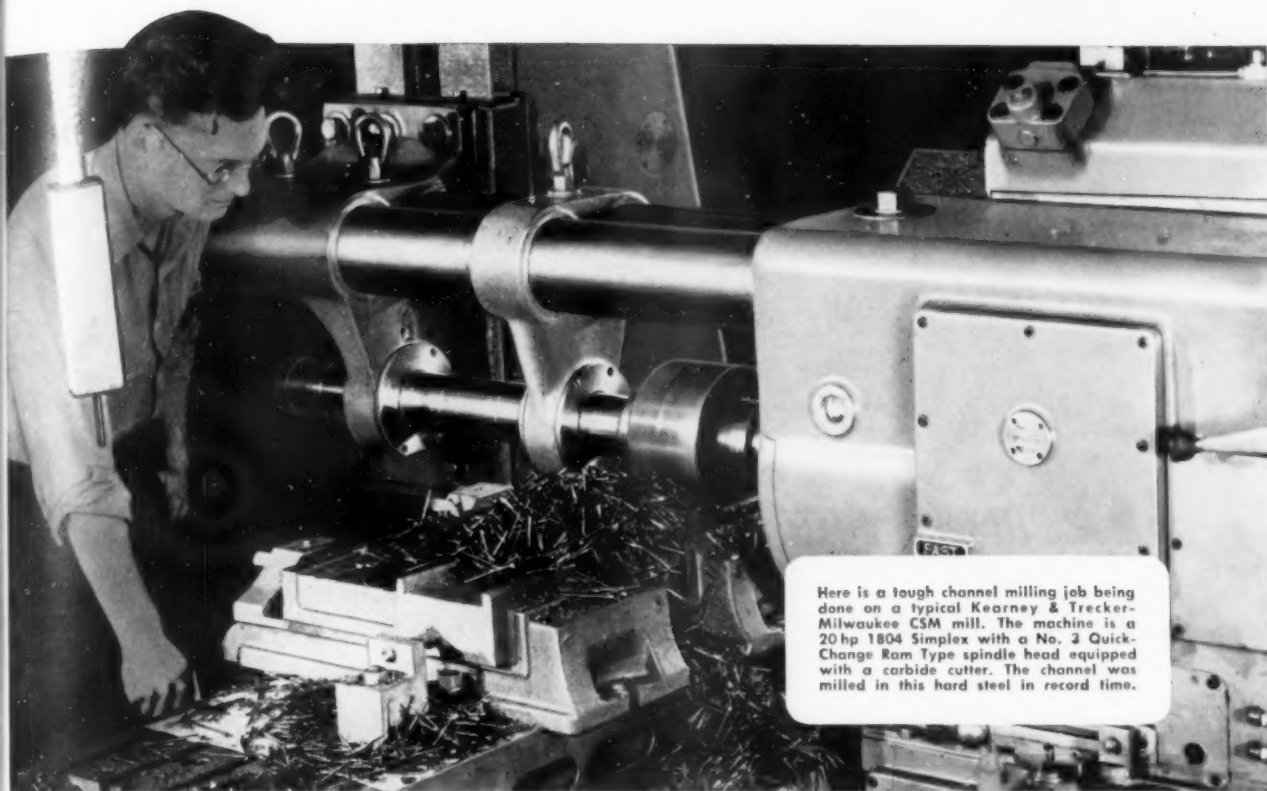


Soft pin knob permits connection to actuating lever or air cylinders by several different methods. Locating bushing, plunger and plunger bushing are hardened and ground.

Plunger is easily assembled from either top or bottom. And it can be removed in either direction by removal of hex nut.



 <p>1</p>	 <p>5</p>		<p><b>UNIVERSAL ENGINEERING COMPANY</b></p> <p><b>FRANKENMUTH 3 MICHIGAN</b></p> <p>(1) BORING CHUCK (2) MIKRO-LOK BORING BAR (3) STANDARD COLLET CHUCK (4) FLOATING COLLET CHUCK (5) WEDGE-LOCK PRODUCTION VISE (6) "KWIK-SWITCH" TOOL HOLDER (7) STANDARD DRILL BUSHING (8) UNIVERSAL INDEX PLUNGER</p>
 <p>2</p>	 <p>6</p>		
 <p>3</p>	 <p>7</p>	 <p>8</p>	
 <p>4</p>			



Here is a tough channel milling job being done on a typical Kearney & Trecker-Milwaukee CSM mill. The machine is a 20 hp 1804 Simplex with a No. 3 Quick-Change Ram Type spindle head equipped with a carbide cutter. The channel was milled in this hard steel in record time.

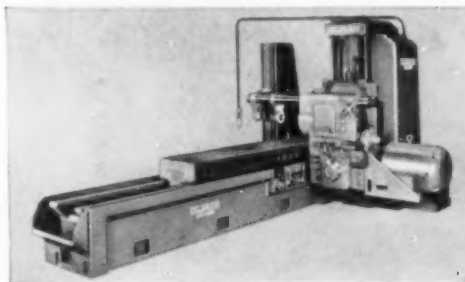
*Put your milling on a profitable production basis...*

## Choose a CSM production mill from over **400** available combinations!

**F**OR more efficient metalworking, investigate the most modern and useful line of bed-type milling machines ever designed. Custom-built from standard units, CSM machines are available in 10 to 50 hp, Simplex and Duplex models with a choice of quill type or ram type heads. Tables are available in four standard widths — 18, 24, 32 and 42" — with travels from 4 to 12'. Rapid traverse rate is 150" per min., and 32 feed rates range from  $\frac{1}{4}$  to 60" per min. You can choose from a wide range of attachments and accessories to meet your exact tooling needs.

Your Kearney & Trecker Special Machinery representative will be pleased to give you all the details... help analyze your machine tool requirements.

**Capacity . . . Experience . . . Performance** — In our just completed \$5,200,000 expansion of our Special Machinery Division, we offer you (1) unmatched facilities, (2) experience based upon more than 50 years in the design and production of special machinery, and (3) performance, best recommended by our outstanding record of successfully solving many hundreds of unusual machining problems.



Here is a 50 hp CSM Simplex Milling Machine with a No. 5 Quick-Change Ram Type Head.

Our complete line of CSM milling machines is described and illustrated in detail in this big 20-page catalog. For your copy write to Kearney & Trecker Corp., Special Machinery Division, 6784 W. National Ave., Milwaukee 14, Wis.

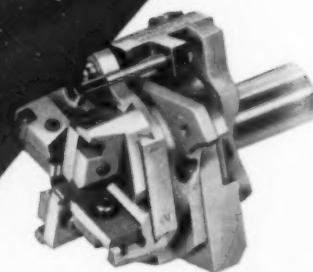


**KEARNEY & TRECKER CORP. • Special Machinery Division**  
MILWAUKEE 14, WIS., U. S. A.

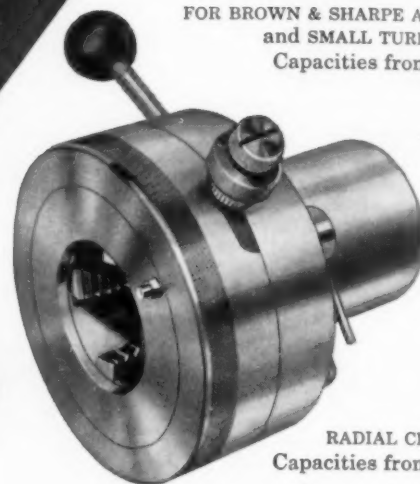
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Since 1835

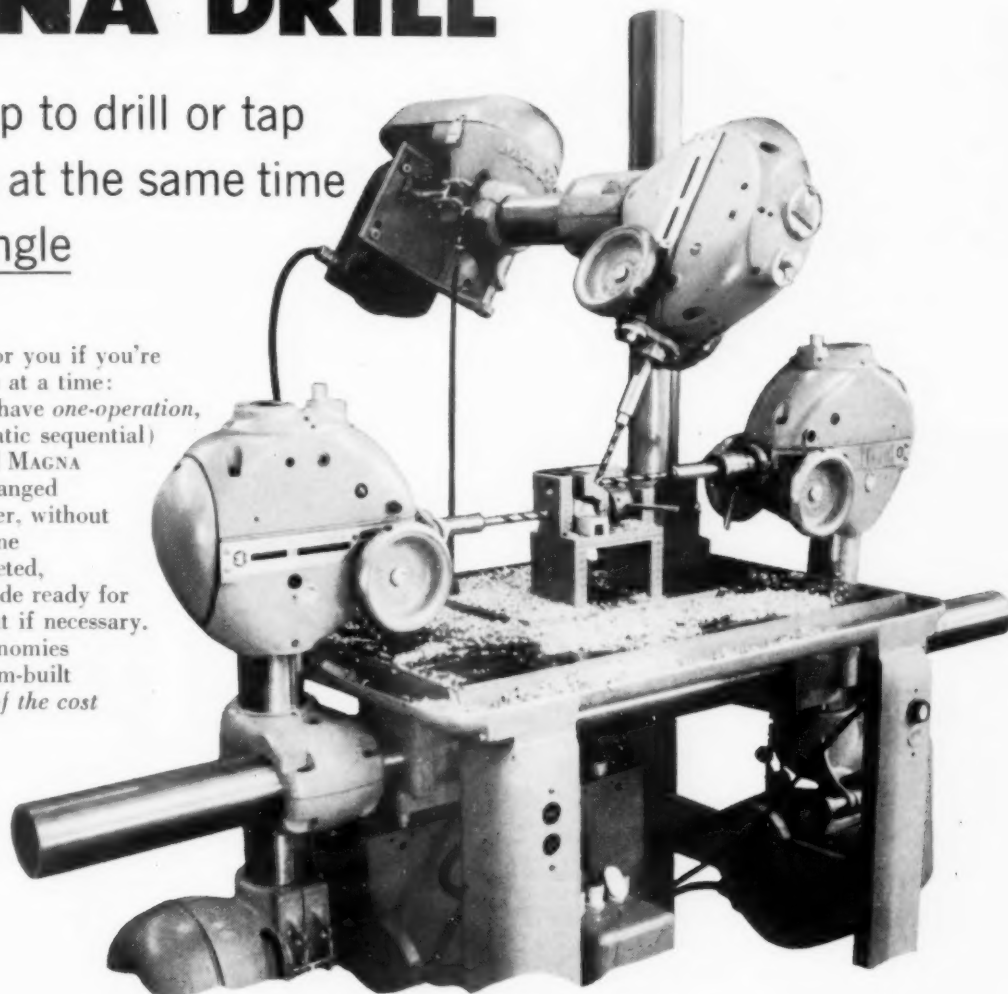
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The one quick way to build a machine around any part...

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Easily set up to drill or tap  
many holes at the same time  
from any angle

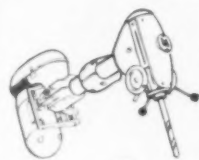
Here's important news for you if you're still machining holes one at a time: With MAGNA DRILL you have *one-operation*, simultaneous (or automatic sequential) drilling or tapping! And MAGNA DRILL can be quickly changed from one setup to another, without special tooling. When one production run is completed, MAGNA DRILL can be made ready for a different run, overnight if necessary. It brings you all the economies of special-purpose, custom-built machines, *at a fraction of the cost of such machines.*



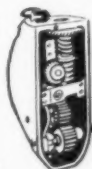
MAGNA DRILL is your only *completely universal* drilling machine. Any number of independently powered heads can be mounted quickly and accurately for simultaneous operation. Each head has its own speed, feed and drilling angle . . . can perform any operation possible with a conventional drill using 1-hp. motor and 5" stroke.

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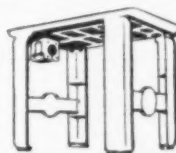
## 1001 QUICK SETUPS POSSIBLE WITH MAGNA DRILL MODULAR COMPONENTS



**DRILL HEADS** Standardized, adjustable heads can be indexed and locked at any angle or position *without special tools*. Variable throat. Right or left hand manual feed. \$285\*.



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**LEAD SCREW TAPPER** consists of reversing starter with all controls; lead screw and nut assembly which replaces normal quill and control plate with limit switches. Installs in 10 minutes. \$260\*.

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Menlo Park, California

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☐ Please have representative call

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# why **WALES** HOLE PUNCHING & NOTCHING EQUIPMENT *Can't be beat!*

Independent, self-contained Wales Hole Punching and Notching Units *reduce setup time from hours to minutes.*

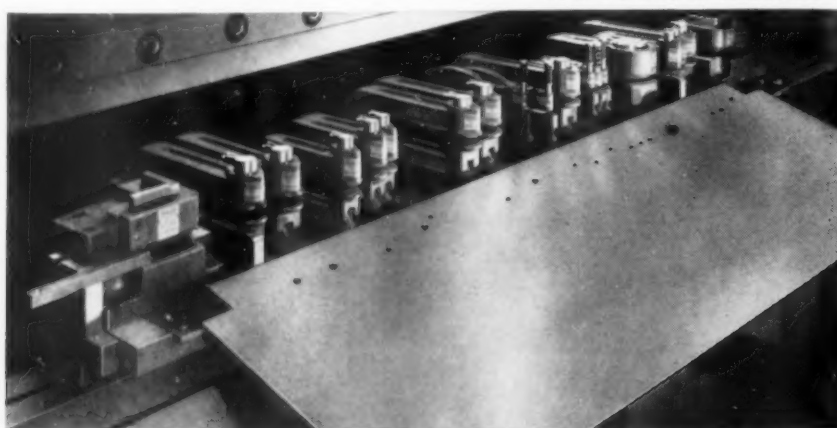
Check these Wales time saving, money saving advantages:

- ▶ Nothing attached to press ram
- ▶ Interchangeable punches and dies

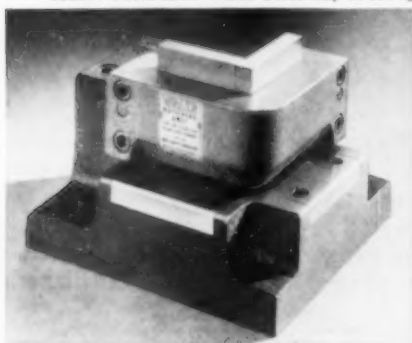
- ▶ Punches and dies always in perfect alignment
- ▶ No die set required
- ▶ Press "down time" practically eliminated
- ▶ Used and reused in unlimited setups
- ▶ Makes setup a simple, quick assembly operation

*Wales Hole Punching and Notching Units "can't be beat."*

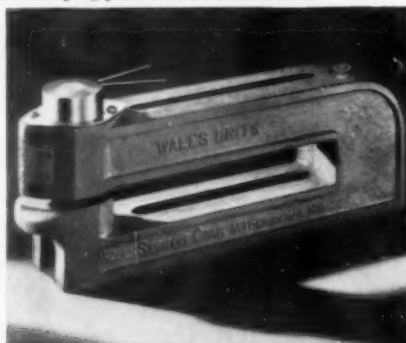
IT'S TOO BIG A STORY TO TELL ON THIS PAGE SO ...



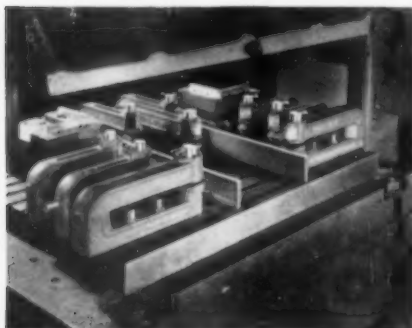
Showing a staggered hole punching setup of Wales Type "BL" Units with Wales Type "NA" Notching Units at each end for hole punching and notching in the same operation on a press brake. These same Wales Units may be set up in a stamping press as shown at bottom.



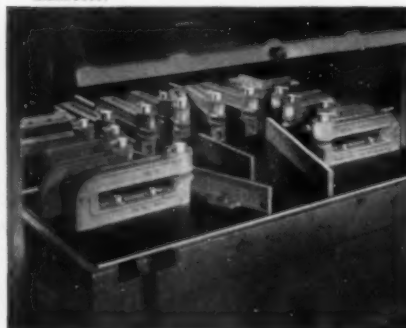
Wales Type "NA" Notching Unit for notching 90° corners.



Wales Type "BL" Hole Punching Units for punching round and shaped holes up to 2" in diameter.



Wales Hole Punching and Notching Units set up on "T" Slotted Plate in a stamping press.



Showing Wales Hole Punching and Notching Units set up on a template in a stamping press.



## **WALES-STRIPPIT CORPORATION**

George F. Wales, Chairman

101 Payne Avenue, North Tonawanda, N. Y.  
(Between Buffalo and Niagara Falls)

Wales-Strippit of Canada Ltd., Hamilton, Ontario

*Specialists in Punching and Notching Equipment*



**SHAVING**—Tractor transmission clusters are shaved automatically on this Michigan 870. Gears are 1.6429" and 2.000" P.D.—23 and 28 tooth. Sizing fixtures, chute loading, and automatic expanding mandrels, plus automatic machine cycle, give an average rate of four per minute for each gear. Changeover requires but a few minutes.

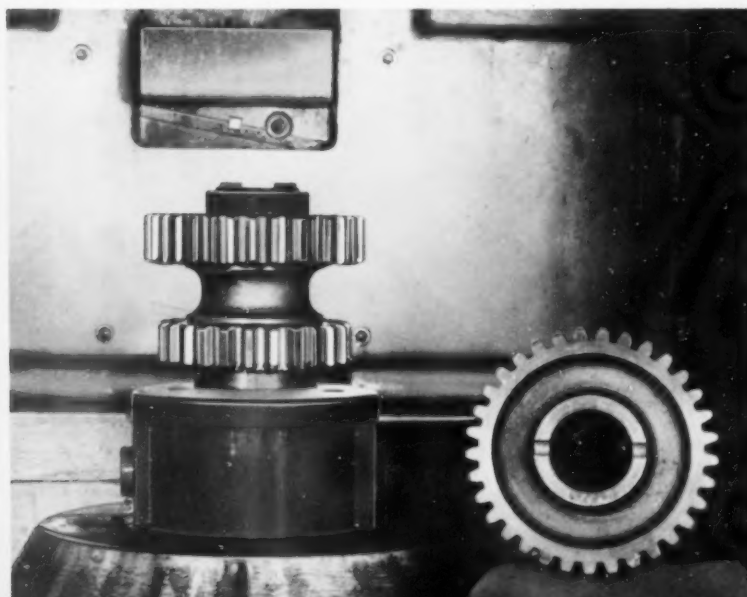
**CHECKING**—One corner of a modern gear laboratory in a large automotive plant. Michigan Sine-Line 1205 lead checker is in foreground, Sine-Line 1124 involute checker in corner with Michigan MTR recorder, and Michigan 471 gear checker at right.



## *This Month's* **GEAR PIX**

**SHAVING**—Both helicals on this big marine herringbone gear are shaved at the same time on this Michigan V-120 gear finisher. Michigan "guided" cutters for shaving large wide-face gears provide added accuracy, especially accuracy of the lead.

**CUTTING**—Michigan Shear-Speed gear shaper cuts both spur gears on this truck transmission cluster. All teeth on the larger gear (33 teeth, 5.34" diameter, 1 1/4" face width) are cut simultaneously in 2.74 minutes.



**MICHIGAN TOOL COMPANY**

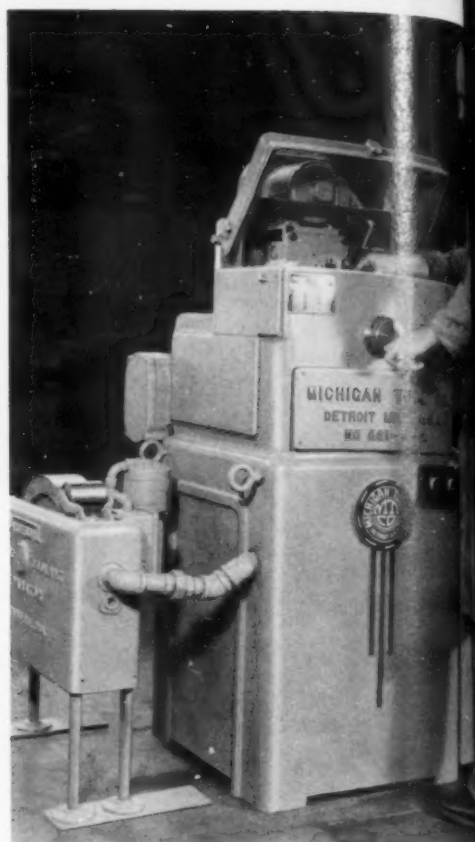
7171 E. McNICHOLS RD. • DETROIT 12, MICH.

*Over*

## This Month's GEAR PIX

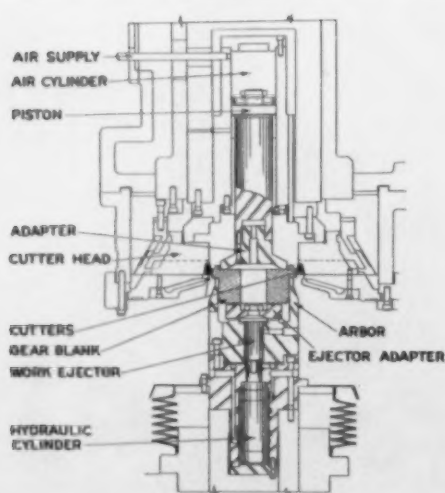


**CUTTING**—Shear-Speed gear shaper cuts 125 transmission gears per hour—500 gears between tool sharpenings—floor space 49 sq. ft. as compared to 312 sq. ft. by former methods. Gears are 2,500" P.D. Pitch diameter is held concentric to internal major spline diameter within 0.0025" total indicator reading.



**SHAVING**—Instrument gears up to 4" diameter are shaved to extreme accuracies at high production rates on this Michigan 861-4B (one of a battery) in an eastern plant. Note magnetic chip separator to insure chip free coolant.

**SPEEDING**—Speed testing of mating gears in a modern transmission plant will be the job of this battery of seven Michigan model 1126 gear speeders. Machines are standard, fixtures are custom made.



↑ **CLAMPING**—Automatic pneumatic clamping and manual hydraulic ejection are available on all models of Michigan Shear-Speed gear shapers now. Details are shown in the drawing above.



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**SAVE TOOL and  
DESIGN COSTS.**

**LARGEST ASSORTMENT  
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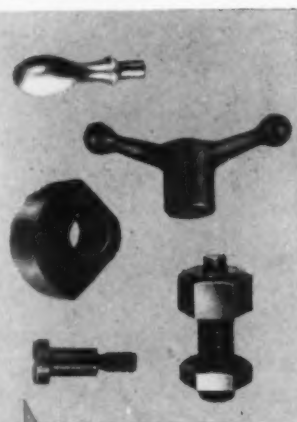
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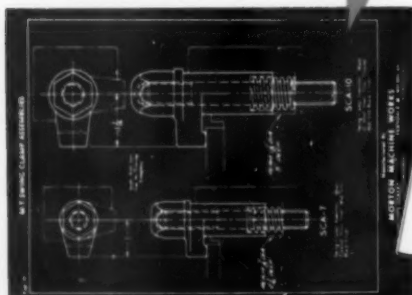
**FIXTURE CLAMPS** • widest range of sizes and types to fit every requirement.

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**The Tool Engineer**



WHEN IT COMES TO PRODUCTION...

... come to

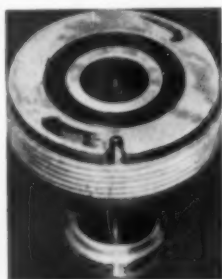
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*Special*

**AUTOMATIC DRILLING & TAPPING MACHINES**

Hartford Special single purpose machines are precision designed built to assure maximum production efficiency and economy. For the best buy in the long run consult Hartford Special — new design available on request. Other Hartford Special production machines include automatic Thread-Robers and Super-Spacers, the world's finest indexing devices.

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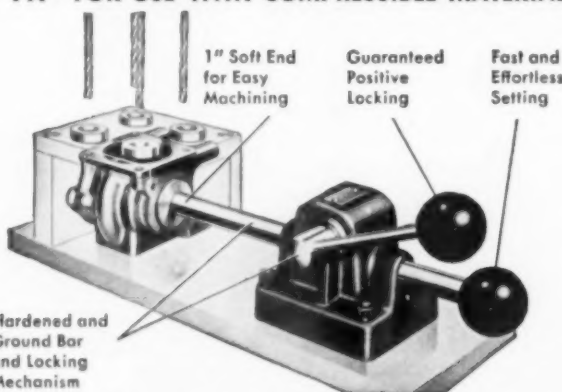
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don't get stuck—stick to the ones made by

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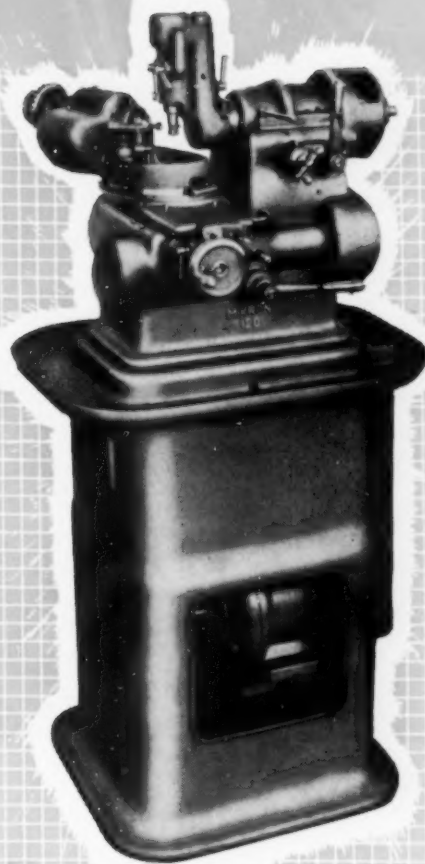
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Warner & Swasey's principle of design plays an important role in this success. Each model is *individually designed*—from the floor up—to handle a *specific range of work*. Machine handling time is thus minimized.

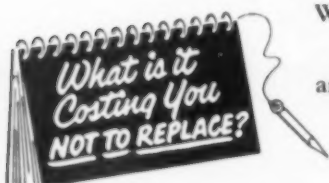
Skilled craftsmen, working to exacting Warner & Swasey standards, combine the most modern machines and processes with certain time-honored hand techniques—so necessary to insure the traditional Warner & Swasey accuracy.

And Warner & Swaseys are *sold right*! By turning

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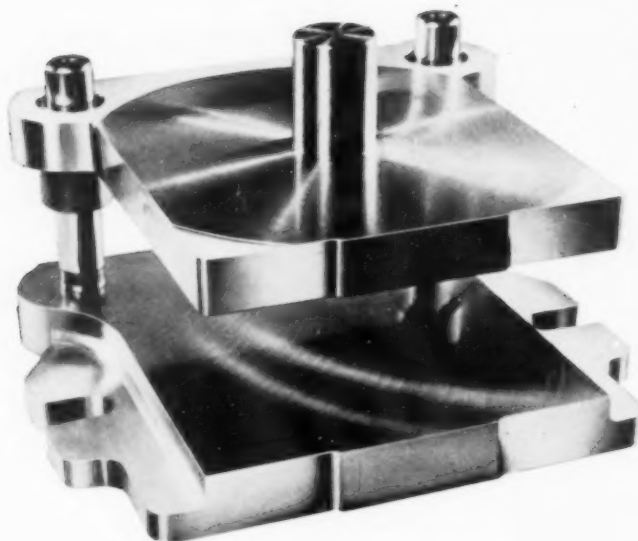
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Danly Die Sets play an important role in the manufacture of Eastman's popular new Brownie movie camera and Brownie movie projectors . . . latest in the Eastman line that Danly Die Sets have helped build all through the years. Used to mount high precision dies, Danly Die Sets help bring "master die" accuracy to every finished part. But Danly Die Sets do more . . . even before a press run ever starts. They make tooling-up easier, faster—save you many, many hours in the die shop. And once in production, these same Danly Die Sets do their share to maintain non-stop production . . . save down-time . . . increase die life. And remember, Danly Die Set service is as quick and convenient as a phone call.

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help you get better design...faster  
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Bristol Hex Socket Cap Screws give a new kind of socket screw performance. Used in products ranging from electric razors to massive machine tools, these modern fasteners have proved themselves with design, production and maintenance men everywhere. Here's why:

Made of special alloy steel, and specially treated to develop the proper hardness and strength, Bristol Hex Socket Cap Screws will give long service under the most severe conditions.

Bristol's Hex Socket Cap Screws set faster and

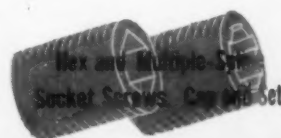
easier, speeding up assembly on the production line. And they do away with protruding screw heads, giving smooth, flush surfaces for safety and streamlined appearance.

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# BRISTOL'S SOCKET SCREWS



THE BRISTOL COMPANY, Socket Screw Division, Waterbury 20, Conn.

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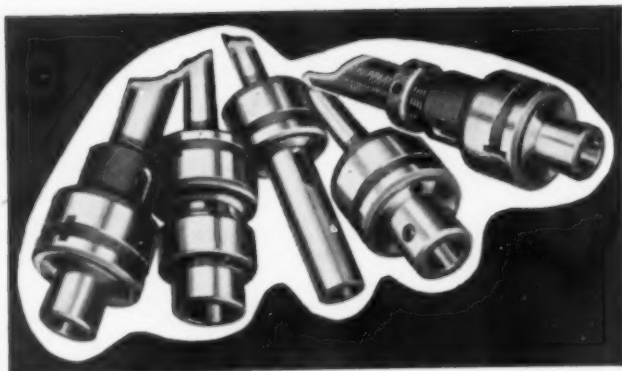


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Put your old worn machines to work! You'll get more production quick, even on close tolerance jobs, with your present machines—new or old—with

# GLENCO

## Floating Tool Holders

They automatically correct alignment as they operate—to  $\frac{1}{32}$ " radius or  $\frac{1}{16}$ " diameter — save time setting up fine adjustments.

## You Don't Believe It?

Prove it on your own jobs without cost. Order a GLENCO Holder now—try it 30 days—then return it or pass for payment. You're the judge.

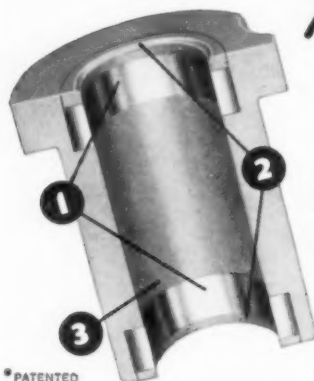
Capacities up to 5" tool diameters in stock. Above illustration shows 5 of the 26 styles. Only 11 parts, all interchangeable within each size range. All are hardened and ground to close tolerances so wear is negligible.

Send for Complete Data File J.

THE J. C. **GLENZER** CO., Inc.  
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## MORE HOLES— MORE ACCURACY— FASTER— AT LESS COST



\*PATENTED

1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

For information and prices write for Meyco Bushing Catalog No. 13

### MEYCO

Carbide Inserted Bushings  
Are Doing It Daily!

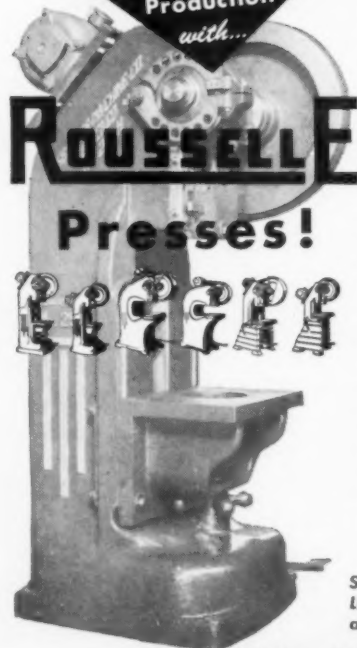
HOW? Like this: (1) Last longer... with a life—in most cases—as long as solid carbide bushings at prices that come close to the prices of ordinary steel bushings; (2) Increased life for your drill jigs and fixtures; (3) Increased life for your drills and reamers; (4) Accuracy maintained for a LONG PERIOD of time; (5) Less non-productive machine time, less lost man-hours, because bushings need not be changed as often; (6) Inspection time saved, because of greater accuracy for a longer time; and (7) Less waste due to spoilage, for the same reason. Don't pass up a good bet! Get the dope on MEYCO Carbide Inserted Drill Jig Bushings today!



W. F. MEYERS CO., INC., BEDFORD, INDIANA

USE READER SERVICE CARD; INDICATE A-3-212-2

More and More Industries  
are Cutting Costs  
and Speeding Up  
Production  
with...



It took some concentrated planning, stressing ruggedness and simplicity, along with accurate machining and "close-tolerance" assembly, to bring out these fast, rigid, high output units — THAT COST SO LITTLE—DO SO MUCH — REQUIRE SO LITTLE MAINTENANCE.

In addition to metal forming, bending, shearing, notching, and piercing, they are also adaptable to cutting and punching paper, forming and cutting fibre, plastics, etc.

Often considerable savings are possible if you let our engineering staff assist you. There is no obligation. Simply explain the problem and send sample or drawing of work.

Russelle Presses are Sold Exclusively through Leading Machinery Dealers and are manufactured by

**SERVICE MACHINE CO.**

7627-33 S. Ashland Ave. • Chicago 20, Illinois

USE READER SERVICE CARD; INDICATE A-3-212-3

# INCREASE YOUR QUALITY PRODUCTION

... by applying the PRECIS-O-NIZING capabilities of the Microhoning process to your work.

Microhoning is *the* industrial process which simultaneously gives you

- ▶ stock removal
- ▶ geometric accuracy
- ▶ size control
- ▶ controlled surface finish.

This functional, controlled-abrading process . . . combining quality with production speed . . . has been the answer to problems in the generation of thousands of cylindrical and flat surfaces of every size and kind of material.

Micromatic equipment assures you of experienced engineering proficiency that has developed **MICRO-HONING MACHINES—TOOLS—FIXTURES** for every major engine manufacturer in the world.

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REPRESENTATIVES: Allied Northwest Machine Tool Corp., 103 S.W. Front Avenue, Portland 4, Oregon. • Tidewater Supply Co., Charlotte 4, North Carolina.

### SUBSIDIARY:

**Micro-Precision Inc., 2205 Lee St., Evanston, Illinois**  
Hydraulic controls • Diesel fuel injection equipment



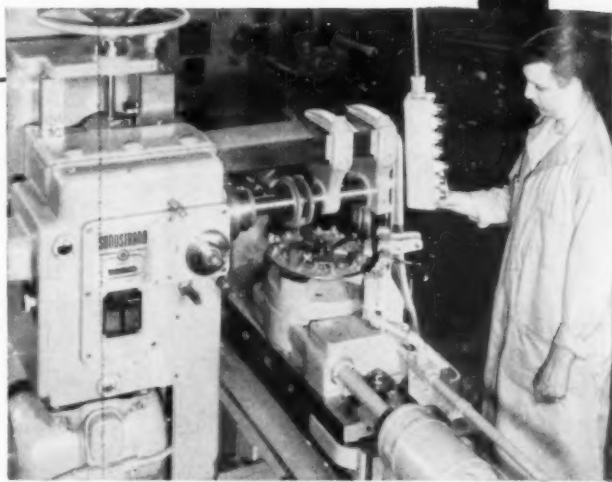
# For Better Milling Methods and Lower Costs . . .

## Use SUNDSTRAND Machines and "Engineered Production" Service

Profitable milling production can be obtained only by lowering unit production costs . . . obtaining the most economical solution to your milling problem and the most productive milling equipment in relation to your production requirements.

Basically, there are two approaches to solving these problems, (1) obtaining standard machines, then trying to process parts over these machines as economically as possible, (2) designing the most profitable processing method, then obtaining machines to suit this method — standard or semi-standard machines, if possible, or entirely special machines, if necessary. This latter method is Sundstrand "Engineered Production" . . . the most practical approach to economical milling. The following is a brief resume of the complete engineering and manufacturing service available from Sundstrand to meet all or any of your production milling requirements in small and medium size work.

These actual examples are presented to reveal one of each of the methods used in solving milling production problems. One of these methods may be the solution to your present problem.



# 1

### Milling Lugs on Clutch Plates With Standard Rigidmil

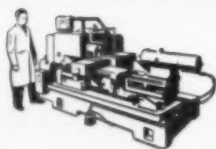
This is a Standard Sundstrand Model 22 Rigidmil equipped with a Sundstrand three station automatic index base. Three lugs on clutch plates ranging from 7" to 12" in diameter, are straddle milled at the rate of 54 pieces per hour. The operator locates the parts by means of a swing type radial locator and clamps part ready for machining. A gang of three cutters mills the slot in the center of the lug and mills two sides. Machine cycle is automatic and operator merely loads, locates and unloads the work.



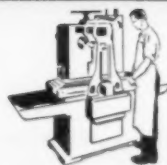
*"Engineered  
Production"  
Service\**

\*REG. U.S. PAT. OFF.

AUTOMATIC LATHES

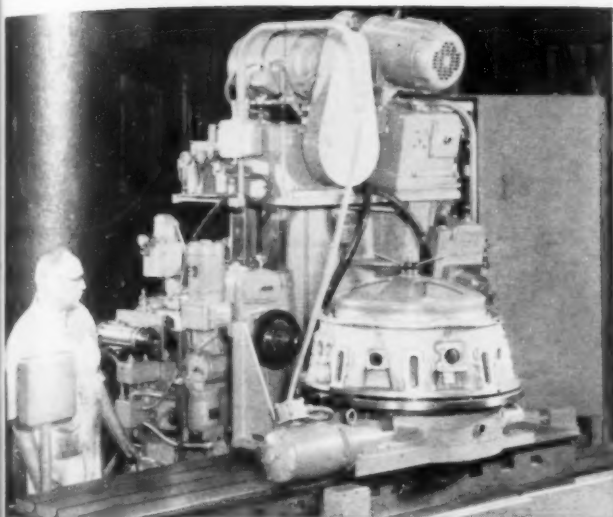


SIMPLEX RIGIDMILS



DUPLEX RIGIDMILS





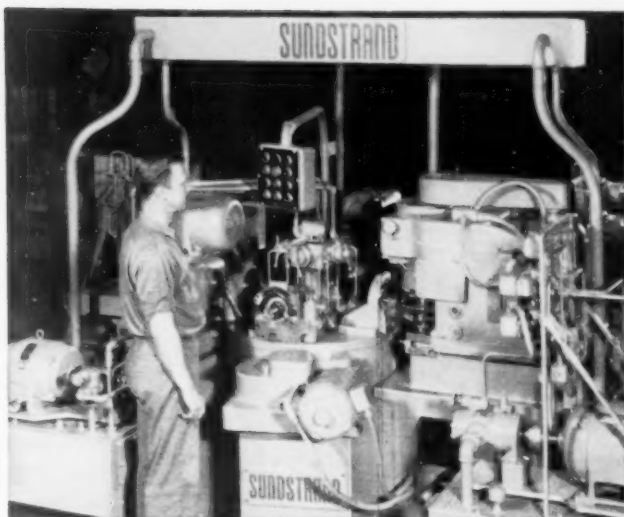
**2**

## Milling Compressor Frames With Semi-Standard Rigidmil

This Sundstrand Model 33 Rigidmil has a single column on which a horizontal and special angular head is mounted. Angular head mills 8 angular pads on rear compressor frames and the horizontal head mills 13 other various sized pads.

Three different diameter cutters are used on the horizontal spindle, depending on size of pad to be milled. Cutters have quick change adaptors to facilitate speedy change over. Depth of cut on horizontal head is determined by setting of dogs.

Table and head feeds are electronically controlled by operator who hand-regulates potentiometers thru a range of 2" to 100" per minute feed. Spindle speeds are controlled by pick-off gears. The special 30" electric index base with 21 stations is push-button controlled.

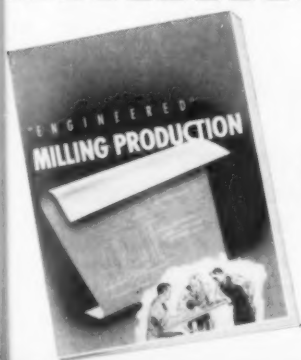


**3**

## Milling Piston Retainers With Special Rigiāmil

Here is a Sundstrand Special Purpose Four Station Process Milling Machine for milling slots in Piston Retainers. Part is located and clamped on O.D. Operator loads and unloads fixture at Station No. 1 and pushes start button. Table indexes to the second station for milling a 7/16" wide slot. A single spindle horizontal milling head is mounted on saddle ways. Saddle feeds up to mill and head and saddle return for index. At station No. 3 a 5/32" wide slot is milled and table indexes to station No. 4. Unit at station No. 3 is identical to that at station No. 2. At station No. 4 a 3/16" wide slot is milled in face of hub. This unit consists of a bedwing having horizontal ways with a vertical spindle milling head.

All milling units are interlocked with the index table for automatic operation. Production is 180 pieces per hour.

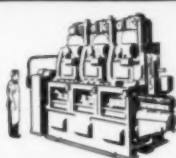
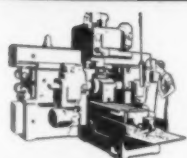


**FREE  
DATA**

You'll find plenty of milling methods in this book : : : methods that may provide a short cut or profitable solution to similar jobs in your shop now. Tooling diagrams and machine designs are both included. Write for your copy today. Ask for Bulletin No. 741.

TRIPLEX RIGIDMILS

SPECIAL MACHINES



**SUNDSTRAND  
Machine Tool Co.**

2540 Eleventh St. • Rockford, Ill., U.S.A.

March, 1954

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-215

215

# When you "SAVE"... *YOU LOSE!*

"Saving" by making your own punches is old-fashioned and expensive.

Check your labor costs  
— your "down-time"—and order

## PORTER PUNCHES

— for immediate delivery.  
Save time — save money  
— with top quality  
punches and die buttons.  
Look to Porter for

*the punch you need...  
when you need it!*

Remember — you don't  
save by making your  
own punches — you lose.

*"Still the best performer"*

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Porter Punches are in stock in all principal cities.

Send for complete catalog and prices—today!

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### *Here's why:*

1. PORTER PUNCHES are available for immediate delivery.  
... they save time — money — by keeping your expensive help at profitable jobs.
2. PORTER PUNCHES are made to "stand the gaff."  
... punches made in your shop are probably made from "available" material ... often the wrong metal for the job.
3. PORTER PUNCHES are offered in standard—and decimal sizes.  
... so your experienced help doesn't spend costly time "whittling."
4. PORTER PUNCHES are reasonably priced.  
... only a "specialist" can make punches as well—or as inexpensively.



*★ Star Performer  
In The Reamer Field*

## Staples

### CARBIDE-TIPPED SHELL TYPE EXPANSION REAMER\*

For maximum tool life with minimum tool servicing, put this Staples Shell Type Expansion Reamer on the job. Tool is returned to original diameter simply by driving the shell up the tapered arbor. Tool can be expanded many times without a re-grind. To obtain a new tool, just order a new shell—a standard stock item.

Standardize on Staples Carbide-Tipped Circular Cutting Tools. You'll get longer tool life—greater accuracy—finer hole finish—and spend less time on tool servicing. Staples is the *quality* name in carbide tool production. You'll save money in the *long* run with Staples.

\*Patented. **FREE!** Illustrated Shop Manual on Carbide Reamer Conditioning. Write on letterhead!

THE STAPLES TOOL COMPANY, Cincinnati 25, Ohio

**Staples** Carbide-Tipped Cutting Tools

A complete line of Circular Carbide-Tipped Cutting Tools  
Expansion Reamers — Special Tools

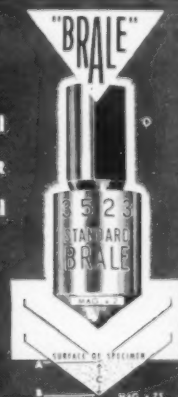
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an  
**ACCO**  
product

Sphero-Conical  
DIAMOND **BRALE** PENETRATOR  
for Hardened Steel

#### HOW IT WORKS

- A. Minor Load Penetration
- B. Major Load Penetration
- C. Linear measurement of penetration increase which "ROCKWELL" converts to hardness reading



### **BRALE Penetrator Accuracy Is Proved in Wilson's Standardizing Laboratory**

One point of hardness on the Rockwell C scale equals .00008", so penetrator accuracy must be constant. That's why Wilson maintains its Standardizing Laboratory for testing and approving every BRALE penetrator.

Each BRALE is precision ground to shape under high magnification to research laboratory accuracy. Wilson's BRALE Penetrator gives true readings at all dial points. For accuracy use a diamond BRALE penetrator on your hardness tester. Write for literature.

**ACCO**

\*Trade Mark Registered

WILSON MECHANICAL INSTRUMENT DIVISION  
AMERICAN CHAIN & CABLE

230-H Park Avenue, New York 17, N. Y.

USE READER SERVICE CARD; INDICATE A-3-216-3

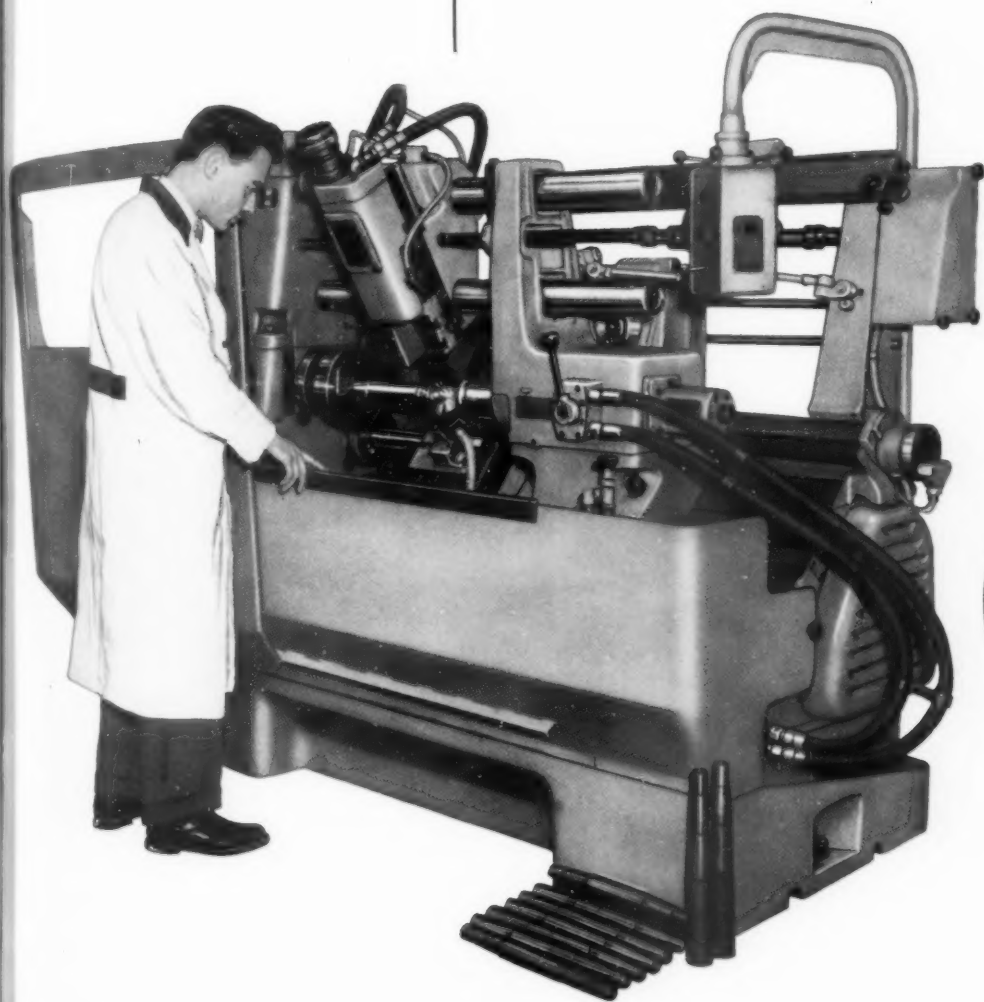
**WILSON**  
"ROCKWELL"  
and TUKON  
Hardness  
Testers

*Introducing the new American built...*



**PILOT**

COMPLETELY AUTOMATIC  
*high speed* HYDRAULIC COPYING LATHE



See its amazing speed  
at the **A.S.T.E.**  
**EXPOSITION**  
in **PHILADELPHIA,**  
April 26-30, Booth 509



Now completely built in the United States to  
JIC standards by Industrial Metal Products Corporation,  
Lansing, Michigan.

*Turn the page to see the Pilot's outstanding features*

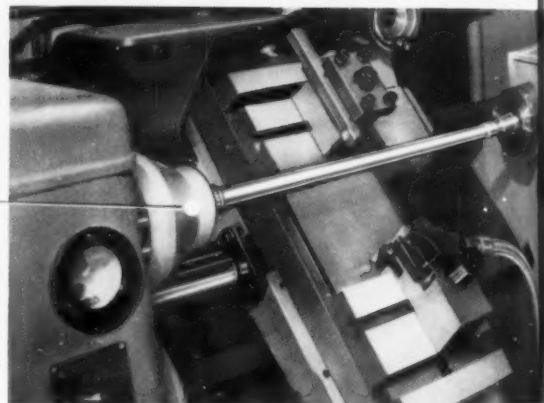
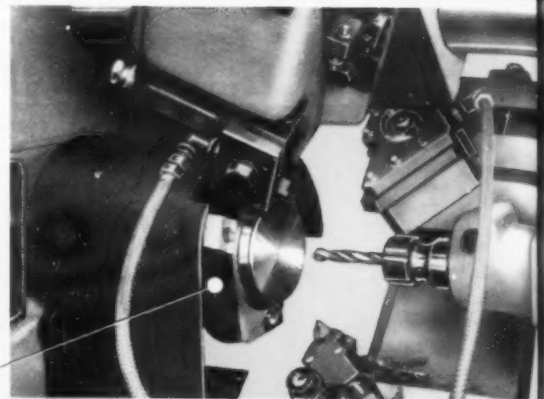
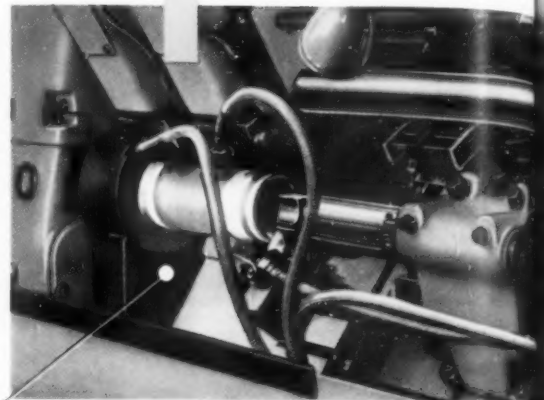
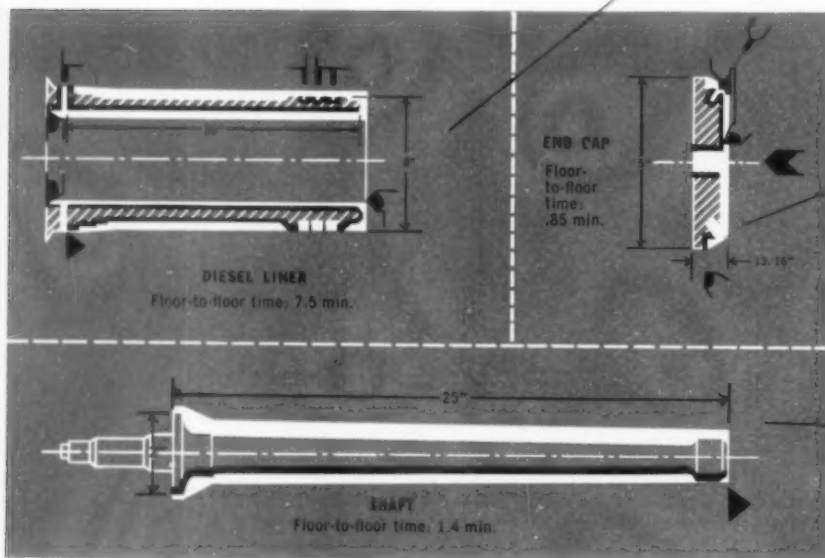
*Throughout the world...*

**Progressive plants that demand the best say H.E.B. is "the way to turn"**

*See the H.E.B. Pilot in action at the A.S.T.E. Exposition in Philadelphia, April 26-30, Booth 506*

**CHECK THESE REASONS WHY:**

- Completely automatic; operator only loads.
- Motors up to 60 HP; spindle speeds 380 to 3000 RPM.
- Standard power operated back tools can be used for copy turning, finishing or undercuts.
- Takes as many as eight different cuts in one cycle if necessary.
- Patented hydraulic carriage feed easily adjusted and vibration-free. Once set, remains absolutely constant.
- Accuracy of .0005" and 32 micro-inch finish obtainable.
- Hydraulically powered infeed slides available.
- Adequate coolant supply built into toolblock.
- Splash guard mounted on rollers.
- Fewer tools necessary, resulting in less down-time.
- Twin cross slides, infinitely variable spindle speeds for constant cutting speed available.



H.E.B. Hydraulic Copying Lathes are also manufactured in OP Models with 20 HP motor; take heavy cuts with carbide tools at spindle speeds 50 to 3600 RPM, economical for short runs . . . And in GT Models with rotating pattern designed to copy an infinite variety of non-circular work.

The new, fully automatic H.E.B. Pilot is a triumph of production engineering—culmination of years of brilliant research by H.E.B., specialists in lathe manufacture and pioneers in the field of copy turning.

**H·E·B**

"THE WAY TO TURN"

**H.E.B. MACHINE TOOLS, INC.**

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COPYING LATHES • ENGINE LATHES WITH COPYING ATTACHMENTS • CARBIDE TOOL GRINDERS • RADIAL DRILLS

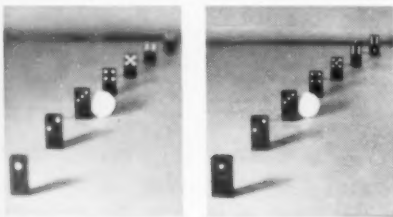
## Main Pointers on Projection

One of the claims we make concerning the Kodak Contour Projector is that once an object is brought into focus at any given magnification it will remain in focus when magnification is changed. (This freedom to change magnification is made possible through the use of a lens turret, mounting six lenses, and speeds inspection procedures.) An operator only need flick a dial to switch from one magnification to another; no time is lost refocusing.

Occasionally, however, one of our customers writes to question our claim and declares that he has found it necessary to refocus when changing magnification. This does not upset us. Almost invariably the difficulty can be traced to the phenomenon of optics called "depth of field." This refers to the distance between the nearest and farthest points sharply defined by a lens and is aptly illustrated by the picture below. It is apparent that when a lens is focused on one object, other objects—nearer and farther from the lens—may appear in acceptable focus.

One of the characteristics of this phenomenon of depth of field is that it decreases sharply as magnification is increased. This is equally true when a lens is focused on an actual object, as with a camera, or on an image of that object, as is the case with our contour projector. The result is that when working at higher magnifications depth of field is considerably less than when working at lower powers.

Consequently, it is possible that an object in focus at 10 power may appear out of focus when magnification is changed to 100 power, where depth of field is less and the need for precise focusing correspondingly

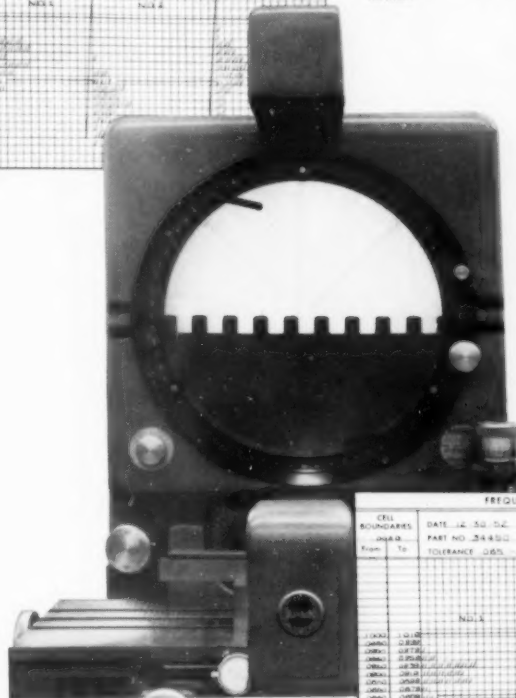


greater. Because of this, we recommend that, when inspecting parts at several magnifications, the part first be focused at the highest magnification to be used. This insures focusing within the narrowest tolerances and, when magnification is changed to a lower power, the part remains in sharp focus on the screen. When this recommendation is followed, complaints on the need for refocusing vanish.

Incidentally, it should be mentioned that neither focus nor depth of field affects accuracy of magnification with the Kodak Contour Projector. This remains as rated irrespective of the precision of focus, thanks to what our optical people call a telecentric stop. Which, in itself, is subject for another in this series of columns.

FREQUENCY DISTRIBUTION				
CELL		DATE 12-18-52	OPERATION ENRICHABLE	
BOUNDARIES		PART NO 34450	PART NAME LITTER PICKER	
FROM	TO	TOLERANCE .005 .101	SPECIFICATION HEIGHT OF FINGER	
SAMPLE SIZE 500 PCS				
NO.	1	2	3	4
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35
36	37	38	39	40
41	42	43	44	45
46	47	48	49	50
51	52	53	54	55
56	57	58	59	60
61	62	63	64	65
66	67	68	69	70
71	72	73	74	75
76	77	78	79	80
81	82	83	84	85
86	87	88	89	90
91	92	93	94	95
96	97	98	99	100

Frequency distribution chart of part size based on optical measurement.



Frequency distribution chart of part size after tool alterations.

FREQUENCY DISTRIBUTION				
CELL	DATE 12-30-52	OPERATION ENRICHED		
BOUNDARIES	PART NO 34450	PART NAME LITTER PICKER		
FROM TO	TOLERANCE .005 .101	SPECIFICATION HEIGHT OF FINGER		
SAMPLE SIZE 500 PCS				
NO. 1		NO. 2	NO. 3	
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35
36	37	38	39	40
41	42	43	44	45
46	47	48	49	50
51	52	53	54	55
56	57	58	59	60
61	62	63	64	65
66	67	68	69	70
71	72	73	74	75
76	77	78	79	80
81	82	83	84	85
86	87	88	89	90
91	92	93	94	95
96	97	98	99	100

## Saved...296 pieces per thousand!

Like many another manufacturer, the Hoover Company, Canton, Ohio, has its rejection problems. A typical one involved a flexible, rubber-like "litter picker" used in its vacuum cleaners. Although tolerances ranged from .085" to .101", rejects ran as high as 30%.

To solve this problem, Hoover employed a Kodak Contour Projector to measure the parts, plotted results in accordance with modern methods of statistical quality control. Based on these studies, alterations were made in the cutting tool and the holding fixture for the part. Rejects dropped from 30% to less

than 1/4 of 1%. Savings amounted to 296 pieces per thousand.

"Optical gaging with the Kodak Contour Projector," say Hoover engineers, "eliminated incorrect readings caused by mechanical distortion of the parts. In addition, optical methods of measurement proved from 4 to 5 times faster than conventional gaging techniques."

Your own production measurement or inspection problem may similarly be solved by optical gaging with a Kodak Contour Projector. To find out more about it, send the coupon for your copy of "The Kodak Contour Projector."

### EASTMAN KODAK COMPANY

Special Products Sales Division, Rochester 4, N. Y.

Please send me a copy of your booklet, "The Kodak Contour Projector."

NAME \_\_\_\_\_ TITLE \_\_\_\_\_

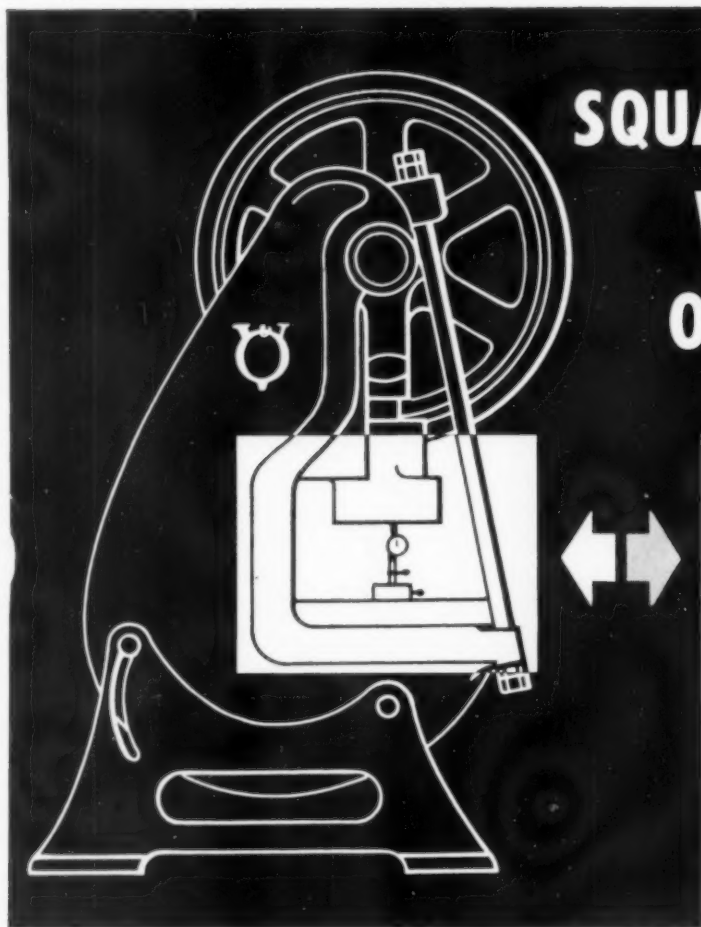
COMPANY \_\_\_\_\_

ADDRESS \_\_\_\_\_

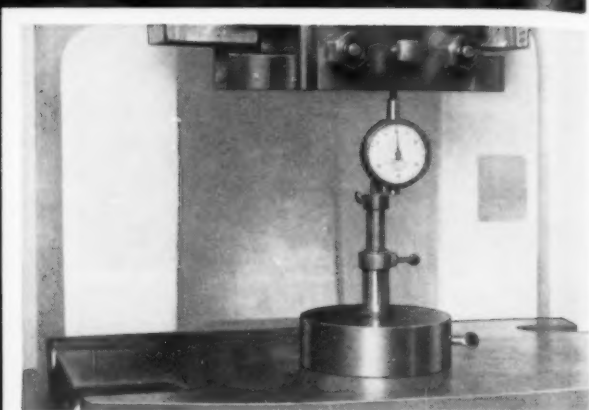
CITY \_\_\_\_\_ STATE \_\_\_\_\_

(Zone)

**Kodak**  
TRADE-MARK



## SQUARE AND PARALLEL WITHIN .0005" ON A 4" STROKE



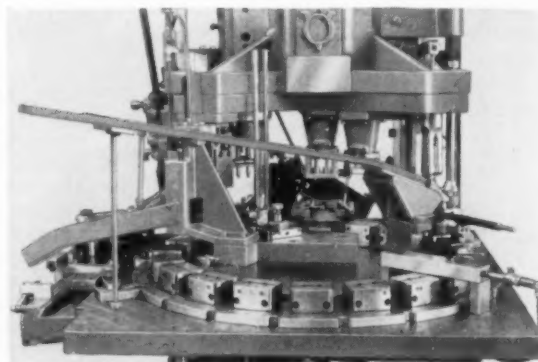
The dial indicator gage may not show a variance greater than .0005" when measuring any opposed points on these two surfaces. The same indicator is used with a ground steel square to check slide travel both F-B and R-L.

That sounds like a machine tool specification, doesn't it? Actually, it is a standard specification for a V & O long slide press: the press that is built like a high grade machine tool. We make special presses to even closer specs.

Operating precision of that order is very important if you want to use carbide dies, or fabricate thin materials, or do deep drawing, or work to high precision. You can do more, and do it better, when your press is highly accurate.

From our viewpoint, since we are going to use long slides we might as well build the rest of the press with accuracy to match. Otherwise, the precision of the long slide would be wasted. So we make extremely accurate ways and use them as reference surfaces with which all the tool carrying parts of the press must line up. And that gives you a press that will do a lot more for you.

Our representative would like to tell you more about the press that is built like a high grade machine tool. Write us, please.



Without high precision relationships between the tool-bearing surfaces and the slide travel of the press the maintenance costs of tooling of this complexity would be prohibitive.

### *Only the best is good enough*



**THE V & O PRESS COMPANY**

DIVISION OF EMHART MFG. CO.

**HUDSON, NEW YORK**

BUILDERS OF PRECISION POWER  
PRESSES AND FEEDS SINCE 1889



★ STOP AND SAY HELLO AT ASTE SHOW-BOOTH 1056

### WHY THE V&O LONG SLIDE PROVIDES BETTER ALIGNMENT

With the same running clearance, the longer the slide the less the possibility for angular misalignment. And we keep our running clearances very close indeed.



# In Jig and Fixture Components . . . You Get The **BEST**



Greater uniformity, higher strength, longer life are provided by quarter-turn screws from forgings. All Lodding fixtures Parkerized to prevent rust.

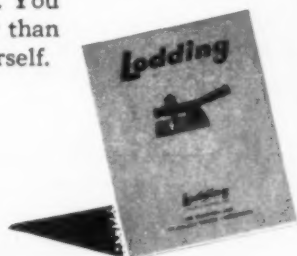
## When You **STANDARDIZE** With

### YOU GET WHAT YOU WANT

Here in the Lodding Line you will find standard assemblies and details to meet your every need — all the components necessary to standardize engineering practice, save design and labor costs.

### AND YOU GET IT QUICKLY

Immediate shipment from completely stocked, coast-to-coast distributors. You receive parts much faster than you can make them yourself.



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**INC.**

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**OF JIG AND FIXTURE COMPONENTS**

**Write for Catalog** — includes full-scale layouts of every Lodding fixture.  
No obligation.

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employees are enrolled  
in the Payroll Savings Plan**



**ROBERT E. GROSS**

*President, Lockheed Aircraft Corporation*  
National Chairman, 1953 Aircraft  
Industry Payroll Savings Drive

*"A man's personal economic security is the sum of his own diligent effort, a financially sound government and a systematic savings plan. He has the earnings and he has the government that can protect the individual. However, human nature being what it is, not everyone maintains a systematic plan of savings. So here is a plan designed to help the employee—the Payroll Savings Plan, whereby his company will regularly invest a part of his earnings (he specifies the amount) in United States Savings Bonds, America's safest form of investment. We at Lockheed have endorsed and encouraged this plan because we know what it does to assure security—both individual and national."*

Lockheed Aircraft Corporation recently conducted a person-to-person canvass that put a Payroll Savings Application Blank in the hands of every employee of Lockheed's eleven plants in Southern California. At the conclusion of this one-week campaign, 36,419 of the 38,037 employees—95.7%—had signed up on the Payroll Savings Plan. Three of the eleven plants achieved 100% enrollment.

Lockheed's 95.7% in the Southern California plants is the highest employee participation of any company or group of this size this year. The previous national record in the aviation industry—92%—was set by Lockheed's Georgia Division in April, 1953. Of Lockheed's total payroll—50,000 men and women—94.9% are building "... security—both individual and national" by systematic investment in U.S. Savings Bonds.

45,000 companies operate Payroll Savings Plans. In many of these companies employee participation ranges from 60% to 80%; in some, it is even higher. On the basis of Payroll

Savings Records, it is safe to estimate that 60% or more of the personnel of a company will join the Payroll Savings Plan—

- if the many personal benefits of the Payroll Savings Plan are properly presented to them by management.
- if they are shown how their monthly investment in Savings Bonds contributes to national stability by adding to our reservoir of future purchasing power —\$35.5 billion—the cash value of outstanding Series E Bonds—the kind purchased by Payroll Savers.

Your State Director, U.S. Treasury Department, is ready to help you build a 60%, 70% or 80% Payroll Savings Plan. He'll explain how easy it is to conduct a simple person-to-person canvass and will furnish all the printed matter, posters, etc. Phone, wire or write today to Savings Bond Division, U.S. Treasury Department, Suite 700, Washington Building, Washington, D.C.

*The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and*

**AMERICAN SOCIETY OF TOOL ENGINEERS**  
10700 Puritan Avenue

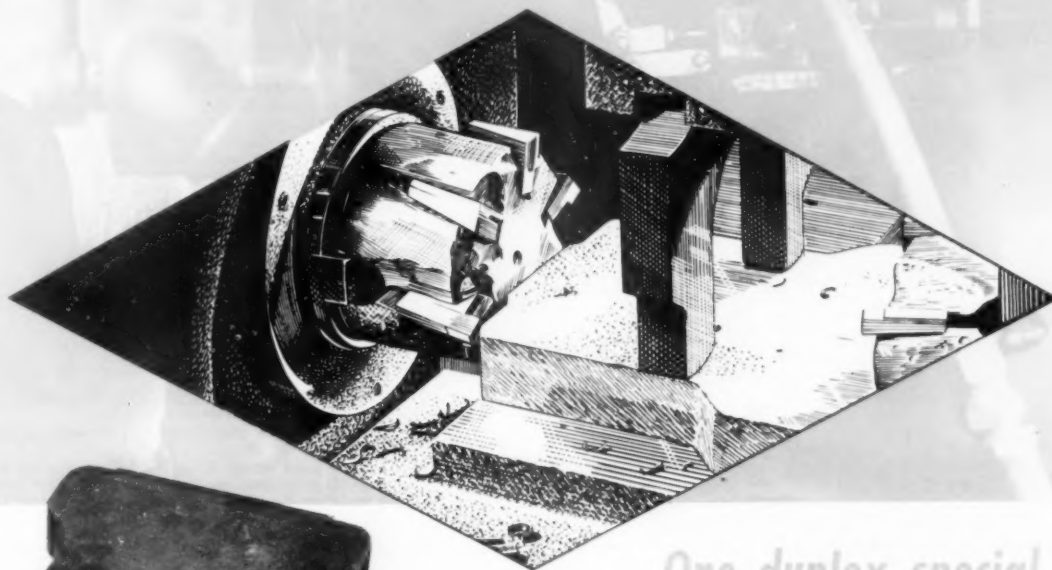
**Detroit 21, Michigan.**



# OK

## Twin carbide endmills finish-cut PRODUCTO DIE SET LOCATE PADS with **ONE** pass

Glass-hard, torch-cut surfaces of 1020-30 boiler plate  
finish-milled in a single stroke with two OK carbide  
end mills on this special miller



*One duplex special now  
does the work of four*



If you have a milling problem,  
why not talk it over with an OK  
engineer? You'll find him well  
informed and experienced in the  
art of metal-cutting.

A special Producto twin spindle locate pad miller, equipped with two OK carbide end mills, finish-mills tough, flame-cut 1020-30 boiler plate in one pass quickly and accurately. One of these machines does the work that formerly required four conventional millers using high-speed steel blades.

Note how firmly the workpiece is anchored with an air-powered clamp. Positive parallelism is assured by the use of opposing spindles. Depth of cut varies 1/8 to 1/4", at a feed rate of 30" per minute. Cutters are standard OK end mills with 6 carbide blades.

They have all the famous OK features: 1) Two components — body and blades. 2) No locks, screws, gibs or gadgets are used or needed. 3) Body is forged and built with more beef in back of each blade. 4) OK cutters pack more blades for finishing cuts and heavier blades for roughing cuts.

**Write for OK Tool Catalogs**

TWO COMPONENTS—  
-BODY AND  
BLADES



# OK

modern milling cutters  
for modern milling machines

THE OK TOOL COMPANY INC., Milford, New Hampshire

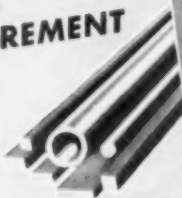
TALIDE-TIPPED  
CENTERLESS BLADES

# Talide Blades Any Size - Any Shape

## Talide (TUNGSTEN CARBIDE) MEETS EVERY REQUIREMENT



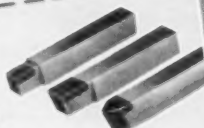
DRAWING DIES



SOLID BAR STOCK



DRILL JIG BUSHINGS



CUTTING TOOLS



ROLLING MILL  
WORK ROLLS



DIAMOND  
PRODUCTS

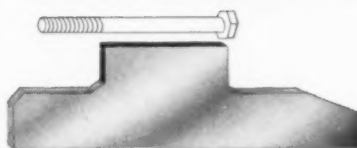


HEAVY-METAL



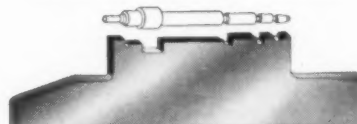
CENTERS

One-piece Talide strip (up to 100" without seams) prevents scoring and scratching. Write for new 84-page Catalog 54-G or ask for sales engineer to call. Metal Carbides Corporation, Youngstown 7, Ohio.



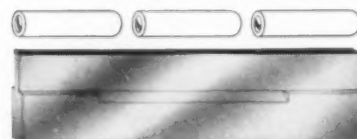
### LEADING BOLT MAKER

PART..... Hardened Alloy Steel Stripper Bolt.  
OPERATION..... Grind O.D. of bolt body.  
MACHINE..... No. 2 Cincinnati Centerless Grinder.  
BLADE..... Standard Talide-tipped Infeed work support blade No. 223877.  
RESULTS..... Talide-tipped blade gave 1600 hours of continuous service compared with normal production of 20 hours obtained with high-speed steel blade.



### LARGE ELECTRIC MOTOR PLANT

PART..... Stainless Steel Rotor Shaft for Electric Motor.  
OPERATION..... Grind 7 diameters simultaneously.  
MACHINE..... No. 2 Cincinnati Centerless Grinder.  
BLADE..... Special multiple step Talide-tipped work support blade No. C-4884.  
RESULTS..... Talide-tipped blade in continuous production for 91 days (2 turns per day) compared to best previous production run of 3 days with hard alloy steel blade.



### LARGE MID-WEST BUSHING PRODUCER

PART..... Cast Bronze Bushing.  
OPERATION..... Grind O.D. of bushing body.  
MACHINE..... No. 12 Landis Centerless Grinder.  
BLADE..... Standard Talide-tipped thru-feed work support Blade No. CA-32328.  
RESULTS..... Talide-tipped blade maintained size without scoring or scratching while grinding 1,000,000 hard bronze bushings—previous Stellite blade wore out after grinding only 40,000.



SINTERED CARBIDES • HOT PRESSED CARBIDES  
HEAVY METAL • CERMETS • HIGH TEMPERATURE ALLOYS  
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

# Now... Machining and Heat Treating



## with TOCCO Induction Heating

Mechanics Universal Joint Division of Borg-Warner Corporation now combines automatic heat-treating and metal-working operations on the same machine!\*

A Tocco Inductor Coil, matched to one spindle of a multiple spindle automatic screw machine, heat treats the inside diameter of automotive trunnion cups—after they have been completely formed on the same machine tool. Twenty-two, 20 and 50 kw, 450,000 cycle TOCCOtron Induction Heating units and 44 automatic screw machines (installed here and in other plants) make up this high-speed production team.

This new method permits the use of SAE 1144 steel and eliminates costly, time-consuming copper plating and carburizing operations formerly required. Heating and quenching cycles total approximately 10 seconds per part, and production is in excess of 300 parts per hour from each machine.

If your products or their components require heat treating, soldering, brazing or forging it will pay you to investigate TOCCO for better, faster ways of producing them at lower unit cost.

\*This process developed and patented by TOCCO.

THE OHIO CRANKSHAFT COMPANY



# TOCCO

\*Trade Mark Reg.  
U. S. Pat. Off.

NEW FREE  
BULLETIN

Mail Coupon Today

THE OHIO CRANKSHAFT CO.

Dept. G-3, Cleveland 1, Ohio

Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating."

Name \_\_\_\_\_

Position \_\_\_\_\_

Company \_\_\_\_\_

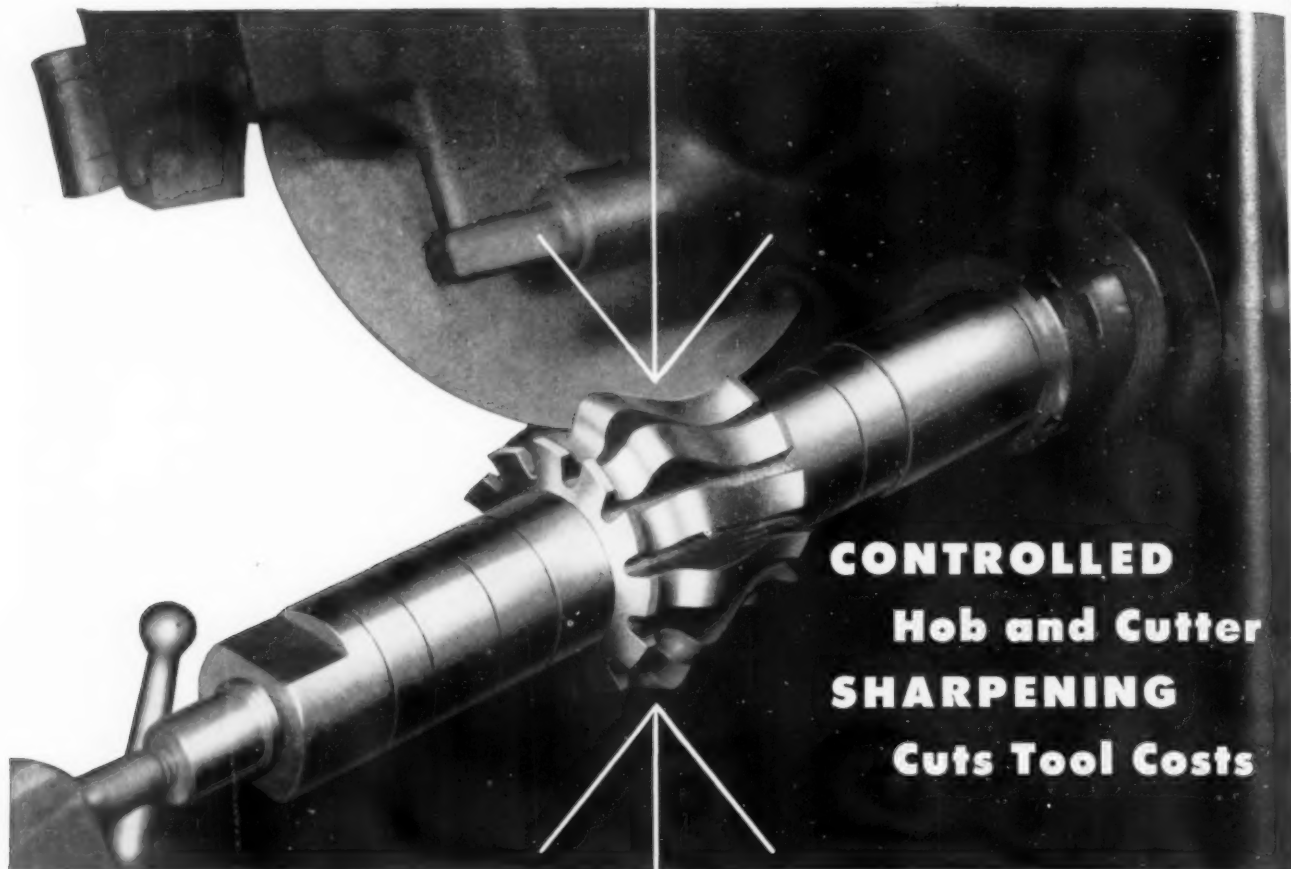
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City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

March, 1954

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225



## **CONTROLLED Hob and Cutter SHARPENING Cuts Tool Costs**

Barber-Colman Sharpening Machines offer a selection of production sharpening equipment for precision control of:

**Tooth Spacing**  
**True Radial or Rake Teeth**  
**Straight or Helical Flutes**  
**Carbide-Tooth Sharpening**

Assure maximum tool performance and maintenance of original tool accuracy by sharpening hobs and form-relieved cutters on Barber-Colman Automatic Sharpening Machines.

Tools sharpened to the established tolerances last longer and cut better.

Ask your Barber-Colman representative for complete information or write direct listing the range of your sharpening requirements.



No. 6-5



No. 4-4



No. 10-12



No. HRS

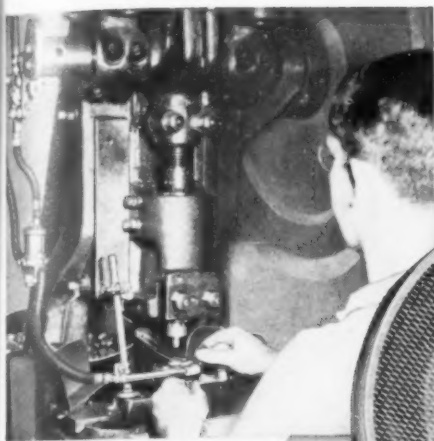


# **Barber-Colman Company**

GENERAL OFFICES AND PLANT,

833 ROCK STREET, ROCKFORD, ILLINOIS

# Some equipment just naturally boosts production



... Schrader Air Controls, for instance. You *can't help* getting smoother, faster operations with air power on your side.

The tireless muscles of compressed air lighten labor all along the production line.

**For ejection of work**, Schrader Air Ejection Sets automatically eject finished parts... eliminate tedious, dangerous hand removal or bulky mechanical devices. Accurately timed to deliver just the correct blast of air, and no more, Schrader Air Ejection Sets are easy on your compressor—while the productivity they add to small presses pays for their installation in a few brief weeks.

**On power presses**, press brakes, and any machine using either a friction or mechanical clutch, Schrader Machine Controls promote building a high-speed work rhythm that pays big production dividends *with safety*. Operators cannot tie down one of the two hand controls, since *both hands* must operate the valves *at the same time* or the press will not function.

These are only two of the many hundreds of new and improved Schrader Air Control Products that build production and safety in your plant. It's easy to get complete details. Write, outlining your present or projected use of power machinery—or fill out the coupon below.

## Schrader

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Air Cylinders • Operating Valves •  
Press & Shear Controls • Air Ejection  
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products  
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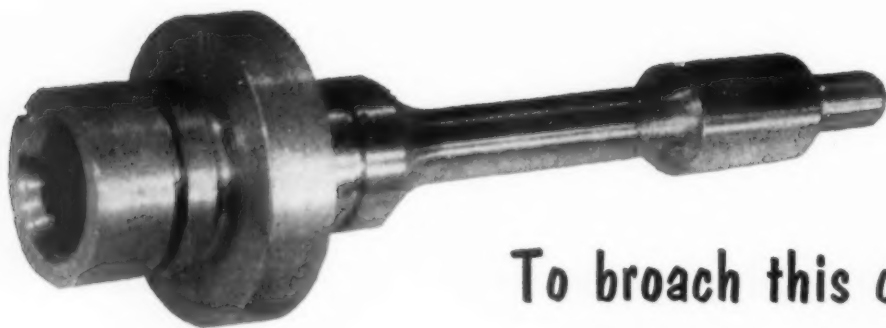
A. SCHRADER'S SON  
Division of Scovill Manufacturing Company, Incorporated  
462 Vanderbilt Ave., Brooklyn 38, N. Y. Dept. H-8

I am interested in more information on.....

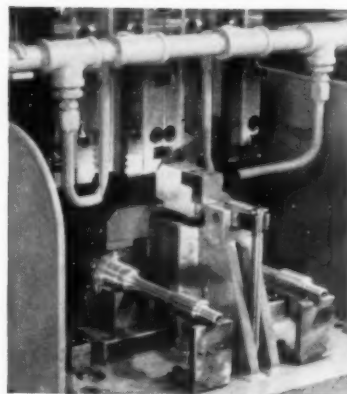
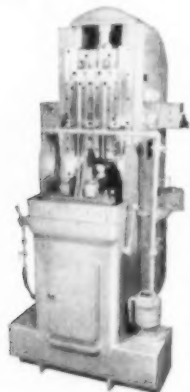
Name.....Title.....

Company.....

Address.....



To broach this clutch gear...



use this *American* machine... in this fashion...



...to get this result!

Approximately 300 clutch gears per hour can be broached on this American 3-Way Type Vertical Hydraulic Broaching Machine. A two station fixture is provided to locate parts in V-shape locators. Air clamping locks the parts into place. At the end of the broaching stroke the parts are automatically unclamped and the operator unloads them while returning the machine ram to starting position.

Flats approximately 5/16" wide are broached

on the diameter of the large end of the gear.

This broaching operation is a standard operation on a standard American machine. If your problem is more difficult, American has the experience and skill to devise a special machine, fixture or broach for your purposes. Send a part-print or sample for a recommendation leading to a solution of your broaching problem. Or send for catalog #300 which illustrates and describes standard American machines.



**American** BROACH & MACHINE CO.  
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery





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There is nothing  
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performance  
to prove  
Butterfield's  
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*the DeLaval Separator Company.....*

OF POUGHKEEPSIE, NEW YORK

emphasizes TWO IMPORTANT POINTS  
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## SIDNEY LATHES

1.

"It has an extremely solid construction which gives a good finish so that very little polishing is necessary."

2.

"It has been accepted by our operator and personnel within the department as a machine of clean, rugged design."

**LET  
SIDNEY LATHES  
PROVE THEIR  
SUPERB PERFORMANCE  
IN YOUR PLANT  
•  
MORE WORK PER HOUR..  
AT  
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PER HOUR**

THE DELAVAL SEPARATOR COMPANY USES  
**SIDNEY FLUID TRACER LATHES**

to make form punches and dies . . . with the satisfactory results mentioned in their comments. All Sidney Lathes are designed throughout to provide unusual strength which insures long life and years of satisfactory performance.

*Write for Bulletins*

**THE SIDNEY MACHINE TOOL CO. • SIDNEY, OHIO**

*Builders of Precision Machinery since 1904*



## But Costs IN TAPPING AND REAMING !



You cut production costs in two ways when you use Ziegler Tool Holders on tapping and reaming jobs.

In the first place, you cut down set-up time, because the set-up does not have to be so accurately made as with ordinary tool holders. Just come within  $1/32$ " on the radius (or  $1/16$ " on the diameter) and the Ziegler Holder will automatically compensate for the inaccuracy.

In the second place, the Ziegler Holder, because of its compensating feature, practically eliminates the spoilage losses due to oversize and bell-mouthed holes.

No wonder Ziegler Holders are becoming ever more widely used. They pay for themselves over and over again in a short time.

**W. M. ZIEGLER TOOL COMPANY**  
13574 AUBURN DETROIT 23, MICH.

**Ziegler**  
ROLLER DRIVE **FLOATING HOLDER**  
for Taps and Reamers...

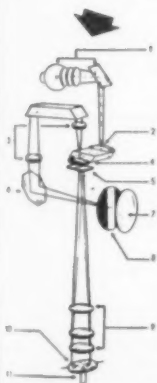
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## NEW OPTICAL METHOD GUARANTEES PRECISION

**USE THE LEITZ  
PROJECTION  
ORTHOMETER**

*"It's Optical Measuring"*



The absence of mechanical or electronic parts assures superior accuracy and reliability since the optical method is practically unaffected by heat, wear of parts, backlash, etc...

This LEITZ ORTHOMETER speeds up inspection, allows more than one person to view scale simultaneously. The only moving parts are the contact tip and mirror.

One graduation represents 50 millionths.

Guaranteed accuracy over full range of 200 graduations (.010") is .00001".

BE SAFE — SEND FOR GUIDE  
"OPTICAL MEASURING METHODS".



**GEORGE SCHERR CO., Inc.**  
COMPLETE LINE OF PRECISION INSTRUMENTS

200-TE LAFAYETTE ST. • N. Y. 12, N. Y.

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March, 1954

## NOW Clutch Operated Models

extend the applications for

**Swanson TURRET INDEXING  
UNITS**



Swanson  
Series TC  
Unit shown  
with optional  
mounting  
brackets.

By providing a "packaged" intermittent-motion chassis, Swanson Turret Indexing Units save time and money in designing and building special automatic machines for precision production operations on small and medium parts.

SWANSON series TC indexing turrets differ basically from the accepted series T units only in the solenoid-operated clutch drive provided. They incorporate the same Swanson cross-over cam and locking device to assure harmonious indexing and accurate, positive positioning at all work stations. They are available in a wide range of turret diameters and work stations, with full provision for mounting operational devices of all types.

The new clutch-operated models have been developed to handle applications requiring a high variable of infinite work cycles . . . or where it is desirable to have the operator control the indexing cycles by push-button controls. Limit switches may also be provided to prevent indexing before completion of any operation cycle. Without obligation, Swanson engineers will be glad to suggest applications of these units and accessories to you. In over a third of a century, Swanson-made machines have improved quality and quantity in hundreds of manufacturing operations.

Write for  
Bulletin TC 4

... See these  
**PRECISION PRODUCTS**  
by **SWANSON**

Booth 1968 ASEE Show

**POWER-DI Press Units**  
**Turntable Units**  
**Feeding Hoppers**  
**Memory Devices for**  
**automatic machines**

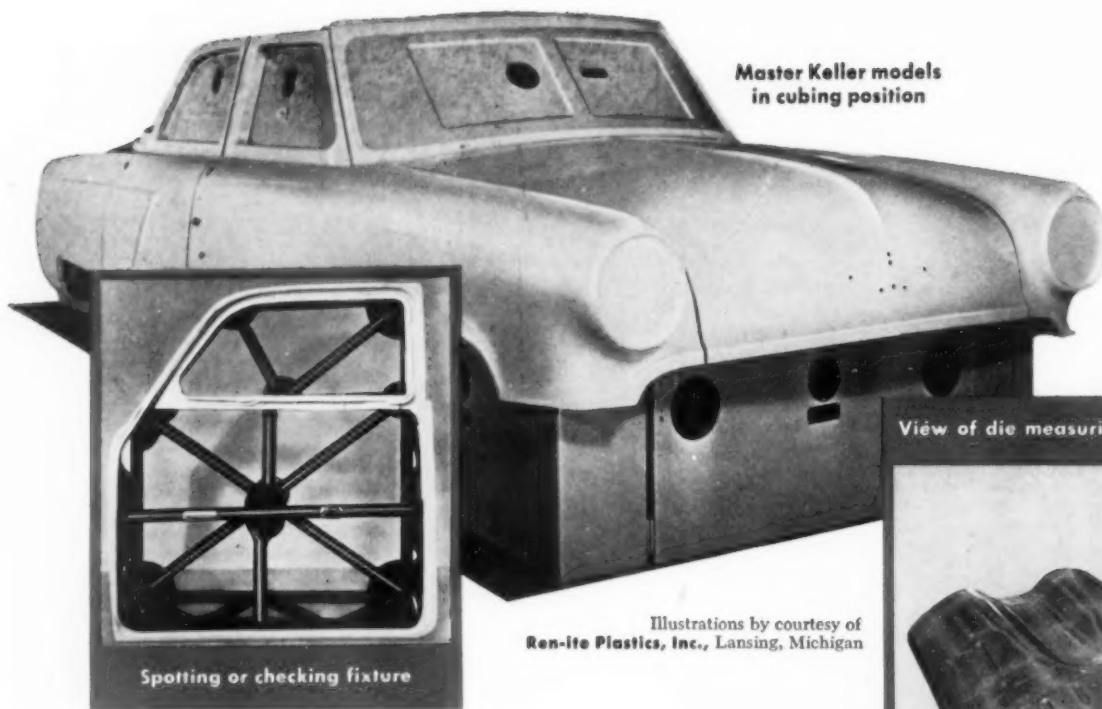
**V-Liner Inspection Units**  
**and Concentricity**  
**Checking Fixtures**

Engineers and Builders of  
Special precision machinery

**SWANSON**  
TOOL & MACHINE PRODUCTS INC., ERIE, PA.

*Quality since 1919*

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Illustrations by courtesy of  
Ren-ite Plastics, Inc., Lansing, Michigan

View of die measuring 36 x 44 inches



# Low-Cost Key to Fast Model Changes—

## PLASTIC JIGS, TOOLS, AND METAL-FORMING DIES

Reduction of tooling costs is a basic goal for the automotive and aircraft industries in 1954. A significant contribution to this program will come from the application of BAKELITE Epoxy Resins for metal-forming dies and fixtures.

These resins can be cast into dies without applied heat or pressure, using molds of glass, plaster, wood, or metal. Adding a special hardener converts the resin syrup into a thermosetting solid in a few hours at room temperature. Shrinkage is negligible. Minute mold details are accurately reproduced. The resulting tools are light in weight, with great impact, flexural, and compressive strengths, and excellent dimensional stability. They can be machined or patched when changes are needed.

Laminations of glass fabric and BAKELITE Epoxy Resin are readily constructed for high-strength, thin-walled fixtures such as spotting die racks, checking fixtures and Keller models. These devices are accurate and tough, will not check or crack, need no edge binding.

Bakelite Company manufactures epoxy resins and their hardeners. Because of the variety of requirements and formulations, address your problems to us for proper recommendations. Write Dept. TR-75.

# BAKELITE

TRADE-MARK

## EPOXY RESINS



TRADE MARK

## BAKELITE COMPANY

A Division of

Union Carbide and Carbon Corporation

UCC

30 East 42nd Street, New York 17, N. Y.

In Canada: Bakelite Company,

Division of Union Carbide Canada Limited  
Belleville, Ontario

# How to Cut the Cost of Gaging Threads

with **TAFT-PEIRCE JOB-RATED GAGES**

The *best* gage for most jobs provides the *best* combination of speed, wear-resistance, upkeep, and initial cost. Here are some comparisons that will help you keep costs to a minimum.

## Thread Plugs



**T-P Limit Thread Plug Gage.** Standard hardened steel gages are lowest in initial cost and are preferable when soft or moderately hard materials are being inspected in limited quantities. Taper-Lock up to 1.510". Reversible from #0 to 1/8". Reversible Tri-Lock above 1.510".



**T-P Electrolized Gages.** With only a modest increase in initial cost, substantially longer wear life can be obtained with this exclusive surface treatment. Many users report up to 3 times longer gage life.

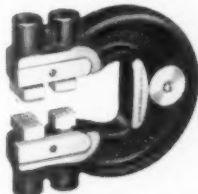


**T-P Carbide Thread Plug Gage.** For exceptional resistance to abrasion or scratching and maximum wear life. Furnished in both standard and special sizes — from #8 machine screw size up.

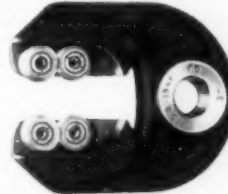
## Rings & Snaps



**T-P Thread Ring Gages.** Lower in initial cost than other gages for external threads, they check a combination of all thread errors but cannot distinguish between them.



**T-P Adjustable Thread Snaps.** Faster than ring gaging, and just as accurate, they check lead, angle, and all other thread elements. Pitch diameter is variable.

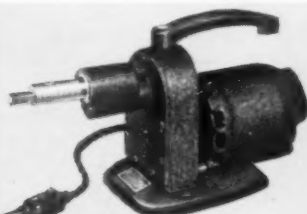


**T-P Roll Thread Snaps.** Same as adjustable, with *rolls* for gaging members. Since gaging members rotate, wear is spread over greater surface and service life increased.

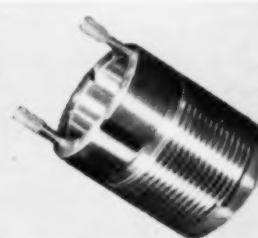
## Special Gages



**T-P Rotochek (Flexible Shaft Model).** Fastest thread gaging method yet devised. Push — and the gage screws into the work. Release the pressure and it stops. Pull — and it disengages. Can be used with most standard T-P plug or ring gages.



**T-P Rotochek (Bench Model).** Permits bringing work to gage, instead of gage to work. Like flexible shaft model, records indicate it triples rate of parts inspection.

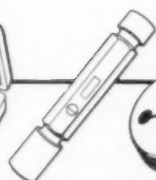


**T-P Thread Concentricity Gage.** Typical of the infinite variety of special gages made to order by T-P every year. This one checks size and location of internal threads.

For the complete story on these items and many more, send for your copy of the Taft-Peirce Handbook.



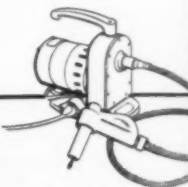
Gage Blocks



Plain Gages



Thread Gages



Rotochek

*T-P means  
Top Precision*



THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, R. I.

March, 1954

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-233

233

*Whether you are tooling  
for short or long-run parts*

*Hi-Den can  
roll back  
forming  
costs*



Above: Hi-Den die which has been band-sawed to rough shape, being hand-finished with woodworking tools to required accuracy. Use of Hi-Den can reduce die fabrication and forming costs 50%.

In aircraft and other light metal industries — wherever tooling cost is an important operational consideration — HI-DEN has effected phenomenal savings. Forming, stretch, draw and press-brake dies, Yoder rolls, jigs, fixtures and pressure pads are but a few of the more than 100 successful applications of HI-DEN.

HI-DEN is a laminate of wood veneers impregnated with phenolic resin and compressed under extreme heat and pressure to approximately half its original thickness. The resultant composition — only 1/6 as heavy as steel — is about three times as strong as equal weight of steel yet is easily shaped with standard tungsten carbide tools.

It has high dimensional stability and is virtually impervious to oil and moisture. Used in forming tools, HI-DEN's low coefficient of friction eliminates scratching and burring. HI-DEN treats the metal better and results in far lower scrap.

Our Technical Bulletin and literature show how to get increased production of superior quality products — at lower cost — with HI-DEN. Send for it today.

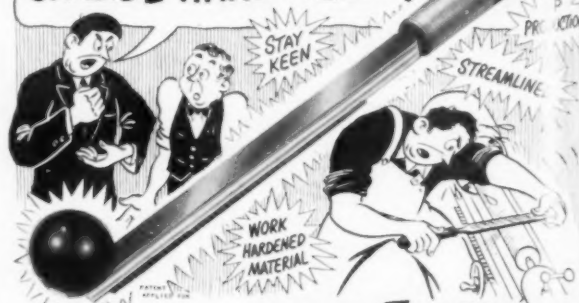
*P.S.*  
HI-DEN'S companion product, Parkwood 8000 (a kraft paper impregnated laminate) is widely used for cutting templates and bench tops. Smooth, hard, but resilient, it won't burr and scratch assemblies of aluminum alloys and other softer metals.

**P**arkwood  
**L**aminates, INC.

32 Water St., Wakefield, Massachusetts

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WHY AREN'T WE USING *Severance*  
CARBIDE HAND FILES?



**MR. PRODUCTION FOREMAN:**

*YOU, TOO, WILL BE ASKED THIS QUESTION  
SOONER OR LATER, BETTER CHECK UP  
BEFORE IT'S TOO LATE!*

*WE'LL SEND YOU COMPLETE INFORMATION  
AND PRICES VIA RETURN AIR MAIL!*

*Phone, wire or write us  
RIGHT NOW!*

**Severance TOOL INDUSTRIES INC.**  
728 IOWA AVE. SAGINAW, MICHIGAN

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**HELICAL SPIRAL  
TAPER PIN  
REAMER**

featuring

Continuous change in lead angle to compensate for continuous change in diameter.

- This feature insures uniform depth of radial undercut (shear) on the entire length of the taper and provides uniform relief at all points on the diameter.
- In stock for immediate delivery sizes #6/0 thru #10. Made promptly to order sizes #11, 12, 13, and 14.
- Backed by 27 years of manufacturing reamers exclusively. We also make Stub Reamers, Die Clearance Reamers, and Special Reamers to your exact specifications.

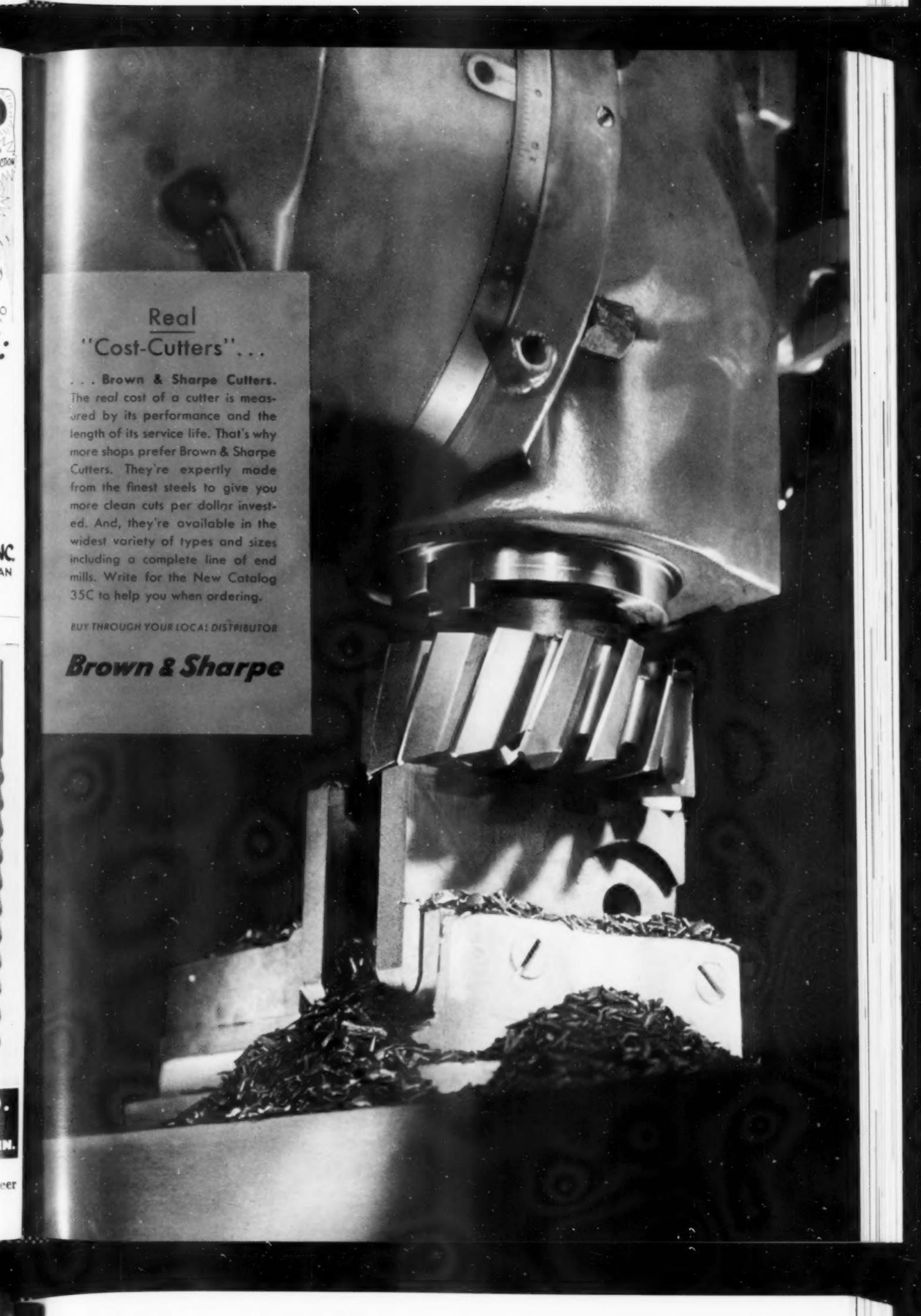
MANUFACTURERS' AGENTS: A few exclusive territories open. Write us.



**THE BUOL MACHINE CO.**  
**REAMERS EXCLUSIVELY**  
**PARK & MEADOW NEW BRITAIN, CONN.**

USE READER SERVICE CARD; INDICATE A-3-234-3

The Tool Engineer




**Real  
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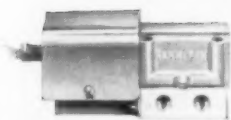
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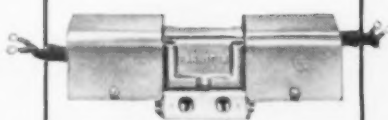
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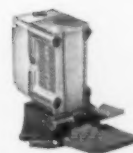
C1-25, Solenoid-Operated Spring Return



CC6-25, Foot Operated



CC11-25, Solenoid-Operated Momentary Contact Type



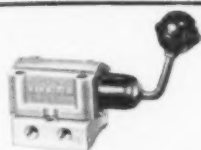
CC7-25, Foot-Operated Locking



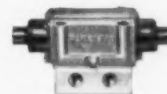
CC2-25, Ball Cam-Operated



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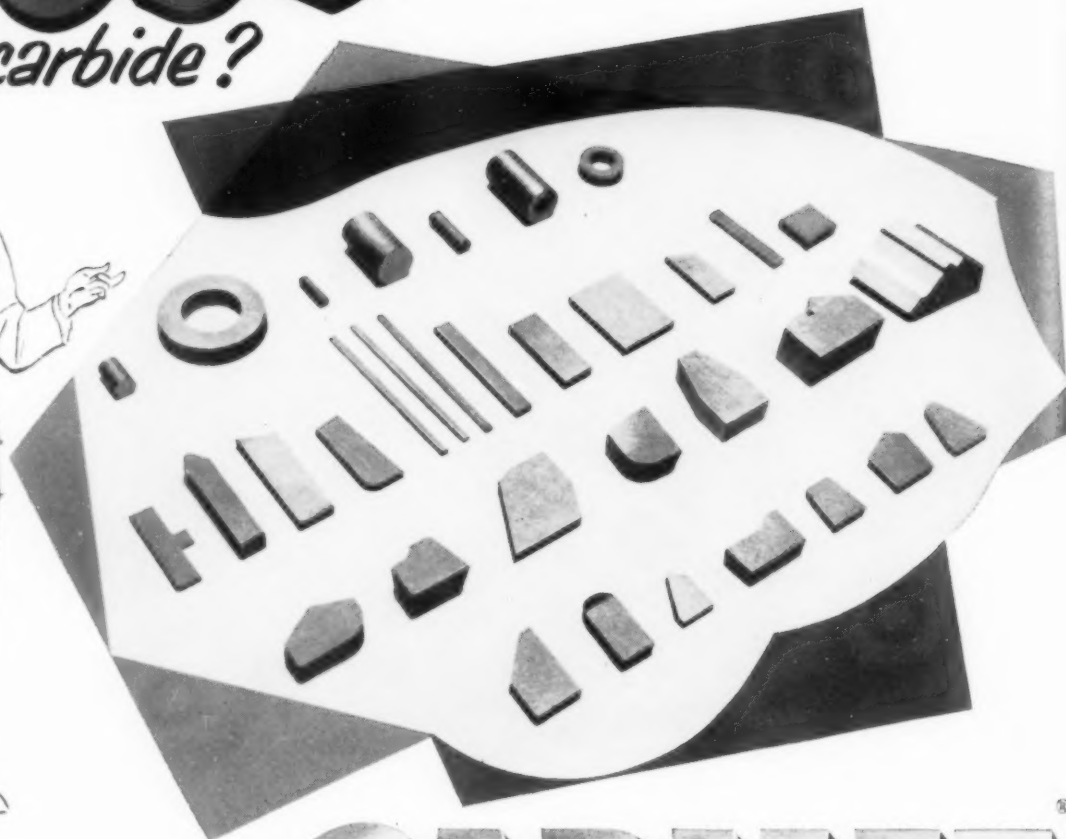


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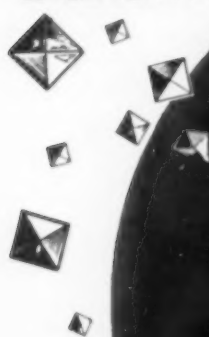
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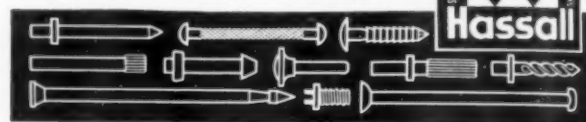
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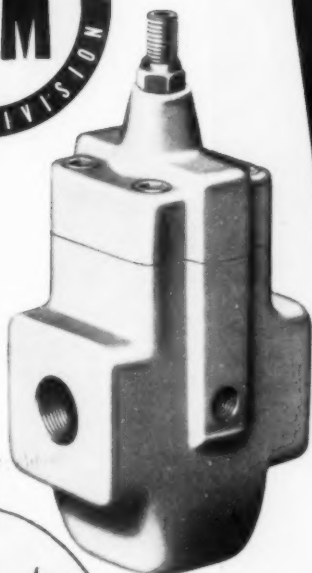
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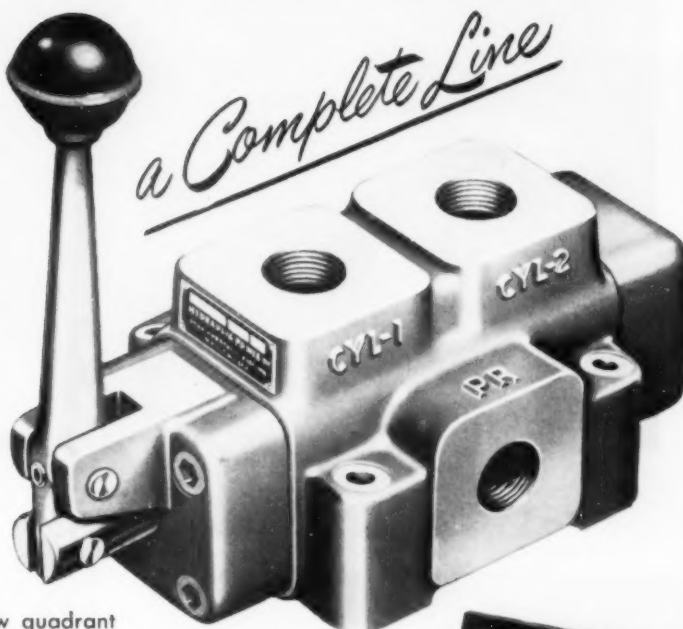
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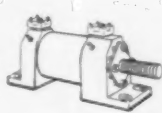
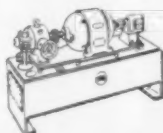


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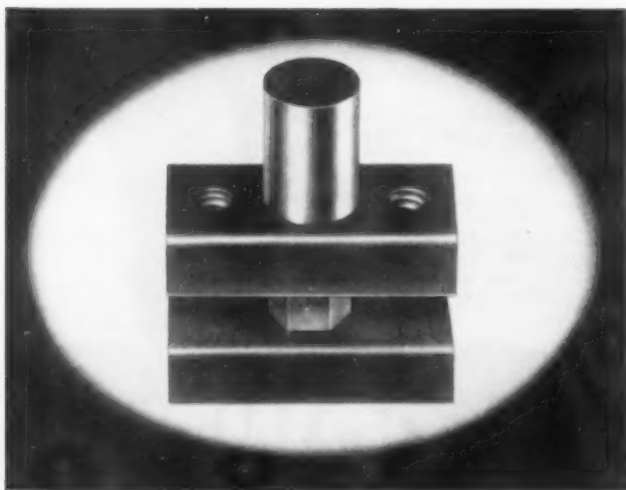
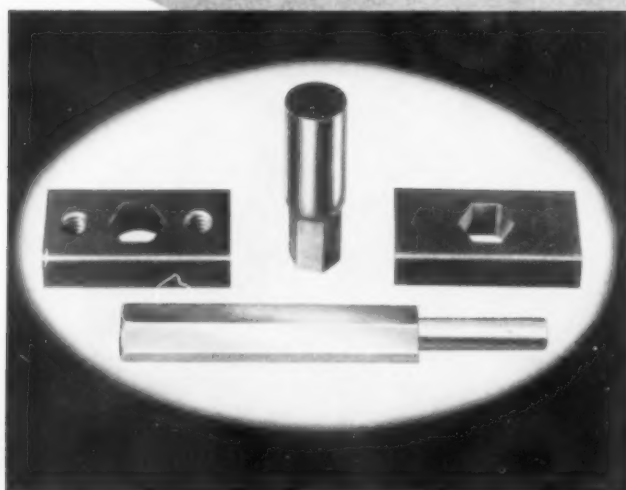
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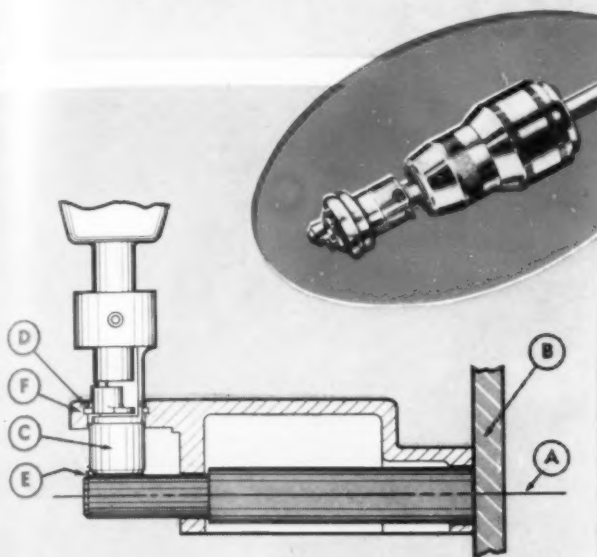
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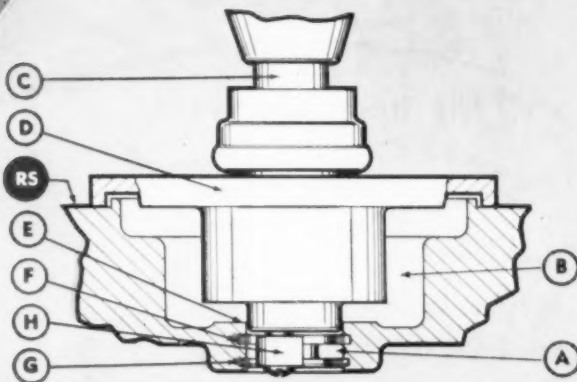
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## Problem: Locating a Groove From Centerline of a Hole A.

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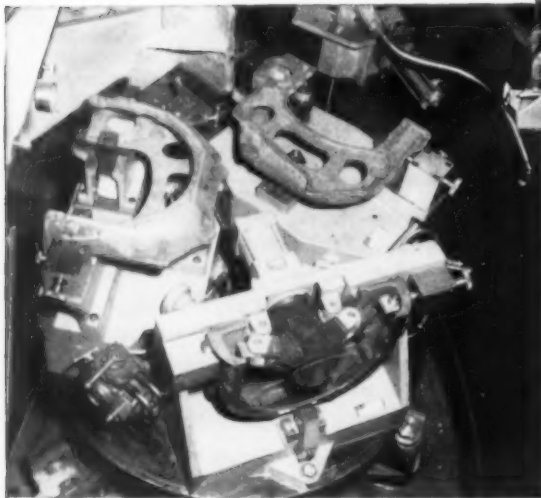


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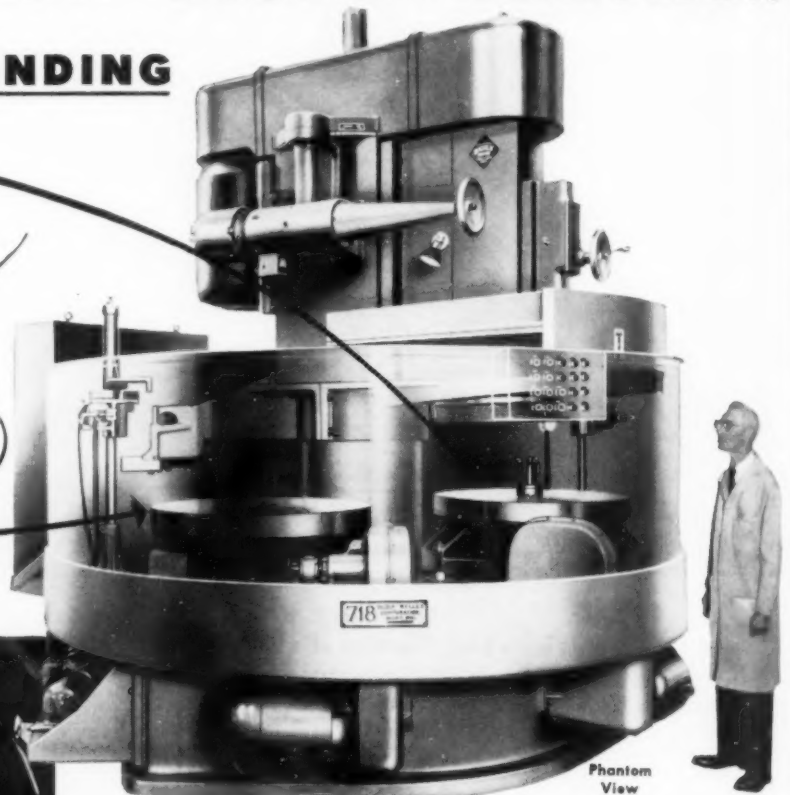
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2. Diamond-hard carbide particles guarantee super wear resistance. Rough turned O.D. and I.D. Saw cut faces. Furnace annealed — no scale. Cut to any length.

Stocks of a range of sizes being built to meet demand. Write for a stock list and Milne's new Hollow Die Catalog section.

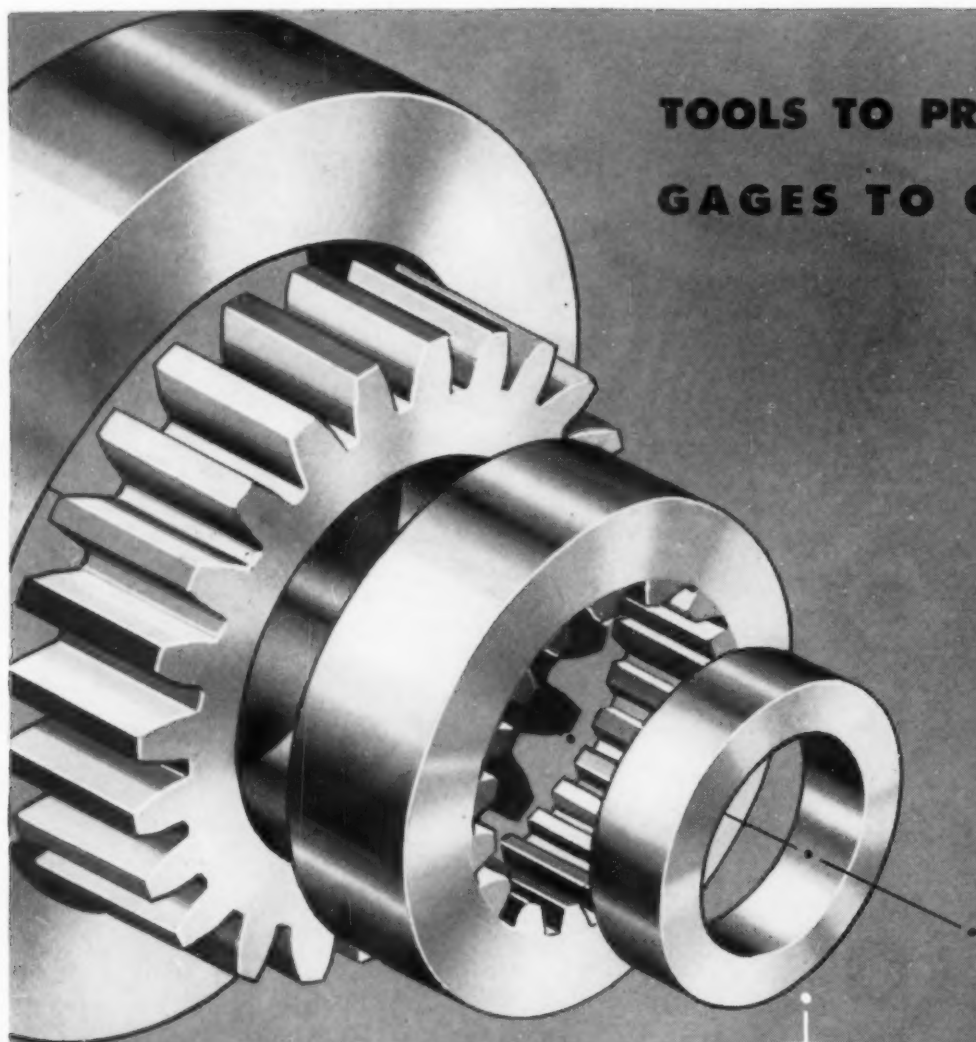
Available Across The Nation . . . Wherever Milne Operates

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Complete line of tool steels . . . Wide range of grades and sizes.				

**A. MILNE & CO.**  
Established 1887  
745 WASHINGTON ST., NEW YORK 14, N.Y.  
America's Leading Tool Steel Specialists  
Complete Line Of Tool Steels—Hollow and Solid

BE SURE TO SEE THE NEW MILNE EXHIBIT BOOTH 429 — A.S.T.E. SHOW PHILA. — APRIL 26—30.



**TOOLS TO PRODUCE** ⊕

**GAGES TO CHECK** ⊕

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PRECISION GAGES • CONE-LOK JIGS • DIAPHRAGM CHUCKS AND ARBORS • PRECISION PARTS  
PRECISION HEAT TREATING OF AIRCRAFT PARTS

# 120 H.P. — MILLING SLOTS

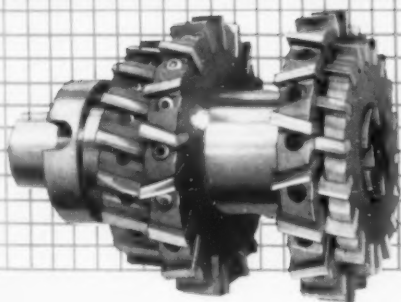
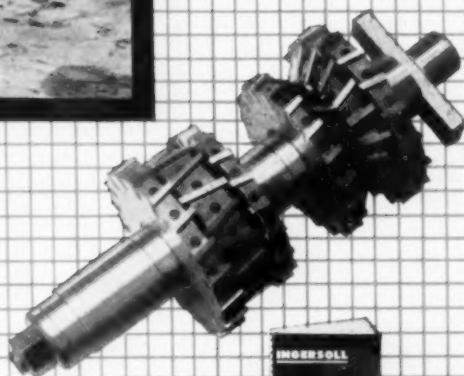
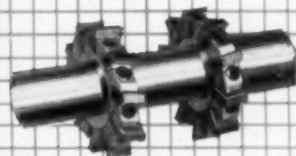
1¼" WIDE, 3¼" DEEP, 20" FEED

This unusual operation with 24" Ingersoll carbide inserted blade slotting cutters is an example of the kind of experience we draw upon when recommending and building arbor cutters for slotting and straddle milling on either light or heavy machines. Cutters of this type are made as small as 4" x 3/8".

Ingersoll cutter engineers are available to help you multiply returns on large investments in production machinery with efficient tooling.



Have you compared the economy of replacing a set of inserted blades instead of buying a complete new solid cutter? The saving is substantial.



There are many opportunities for substantial savings in this class of work by using combinations of cutters to machine a number of surfaces in one pass.

WRITE FOR Catalog 60F, describing Ingersoll Inserted Blade face mills, end mills, helical slab mills, side mills, arbor cutters, angular cutters, and boring heads.

# THE INGERSOLL

MILLING MACHINE COMPANY

ROCKFORD, ILLINOIS, U. S. A.

BUILDERS OF SPECIAL DESIGN MILLING & BORING MACHINES

ORIGINATORS OF *SHEAR CLEAR* CUTTERS

March, 1954

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-251

251

# Lepel's 3 NEW

## LOW COST - PORTABLE HIGH FREQUENCY *Induction* HEATING UNITS



MODEL 2 KW  
Spark Gap Operated

**\$870.**

f.o.b. factory

### *Ideal for*

- Production Heating of small parts
- Research Laboratories
- Tool Rooms
- Machine Shops
- Educational Institutions



MODEL T-2 1/2-1  
Electronic Tube  
Operated

**\$1620.**

f.o.b. factory



MODEL T-1  
Electronic Tube  
Operated

**\$885.**

f.o.b. factory

The Lepel line of induction heating units represents the most advanced thought in the field of electronics as well as the most practical and efficient source of heat yet developed for industrial heating. With a background of half a century of pioneering electrical and metallurgical experience, the name Lepel has become the symbol of induction heating equipment embodying the highest standards of engineering achievement, dependable low cost operation and safety.

Amazing in its speed, Lepel equipment reduces the time required for hardening, annealing, stress relieving, brazing, soldering and melting from minutes to seconds. It performs these operations with a degree of precision and uniformity rarely attained through other processes.

**LEPEL Electronic Tube GENERATORS available from 1 kw to 100 kw.**

**LEPEL Spark Gap CONVERTERS available from 2 kw to 30 kw.**

WRITE FOR THE NEW LEPEL CATALOG . . . 36 illustrated pages  
packed with valuable information on high frequency induction heating.

### **BRAZING**

Permits widest choice of silver or copper brazing alloys from lowest to highest melting points. Ideal for brazing carbide tips.

### **HARDENING**

Heat localized exactly where wanted at desired temperature. Ideal for gears, cams, bearing surfaces, cutting tools and other areas that are subject to wear.

### **SOLDERING**

Speedily and neatly performs intricate soldering applications with or without the use of pre-formed rings.

### **ANNEALING**

Ideal for annealing, stress-relieving, normalizing or pre-heating selected areas.

### **MELTING**

Readily melts quantities of ferrous and non-ferrous metals in either graphite or ceramic crucibles.

All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.



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# DIXI 60

COMBINATION HORIZONTAL BORING MILL AND  
JIG BORER WITH OPTICAL MICROSCOPES

## OUTSTANDING FEATURES:

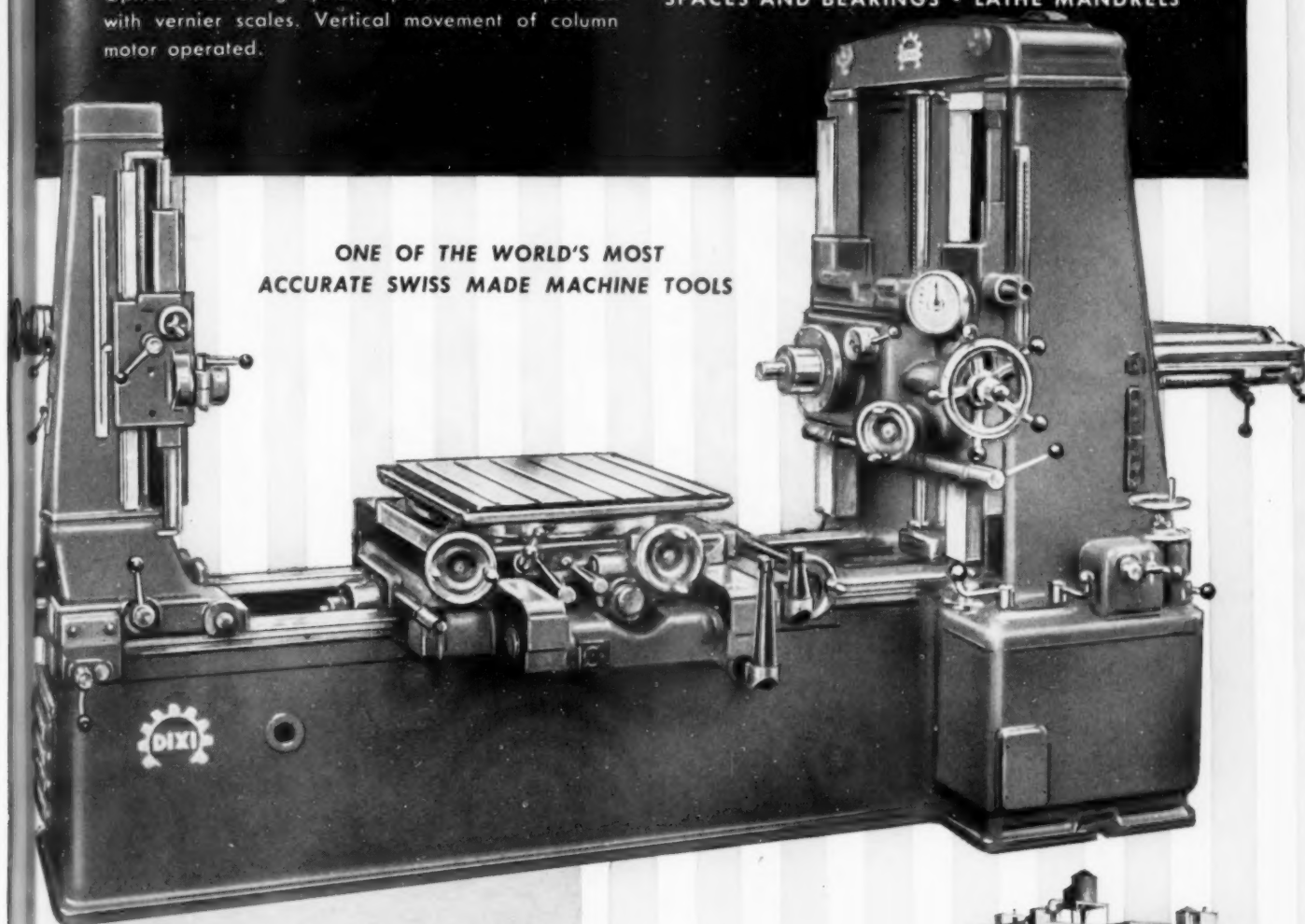
A precision machine for drilling, boring, recessing, and milling work. Table can be rotated to 360 degrees. Accurate automatic locking of rotary table every 15 degrees, and at any other position by hand. Table and spindlehead have variable hydraulic feed. All coordinate dimensions can be set by dials, and adjustment made through optical microscopes. Mechanical spindle feed can be changed without stopping machine. Automatic stop of spindle feed. Optical measuring system operates in conjunction with vernier scales. Vertical movement of column motor operated.

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and building machinery

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LOW COST MULTI PURPOSE VISES • TAPPING  
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SPACES AND BEARINGS • LATHE MANDRELS

ONE OF THE WORLD'S MOST  
ACCURATE SWISS MADE MACHINE TOOLS



Headstock, column, and table settings by optical microscopes to insure overall accuracy of .0002". Built in rotary table with optical microscope. Tables size 28 3/4" x 32 1/4". Max. distance table to spindle 19.7". Table travel, 23 1/2". Hydraulic feeds for all functions 0-78" per min. #40 Taper spindle. Spindle travel 24.4". Spindle speeds 32-1350 R.P.M. Feeds .0015"-.010" per rev.

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CABLE ADDRESS: MACHBUILD, NEW YORK

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- **MILLED**  
4 FEET PADS
- **FINISH BORED**  
3 DIAMETERS  
BOTH SIDES
- **DRILLED**  
3 HOLES AND COMB.  
DRILL & REAM 2 HOLES
- **FINISH FACED**  
BOTH SIDES
- **ROUGH BORED**  
3 DIAM. UP TO 14½"  
BOTH SIDES
- **DRILLED**  
4 END HOLES  
BOTH SIDES
- **ROUGH FACED**  
BOTH SIDES
- **TAPPED**  
4 END HOLES  
BOTH SIDES

Additional holes not shown but completely drilled and tapped are the specification plate holes, eye bolt hole and conduit box holes.

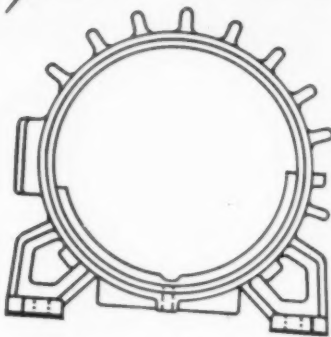
**NATCO  
ENGINEERED**  
for quality and  
quantity production

**SIZES**

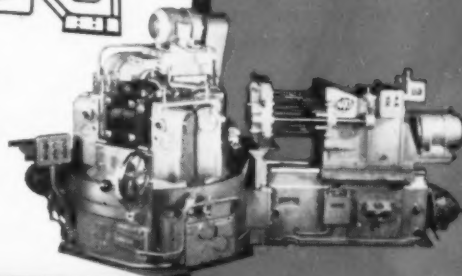
**MILL & DRILL**

**48  
MOTOR  
FRAMES**

PER HOUR



MILL 4 FEET PADS  
DRILL 3 HOLES  
COMB. DRILL AND  
REAM 2 HOLES

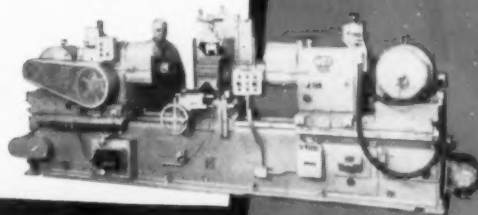
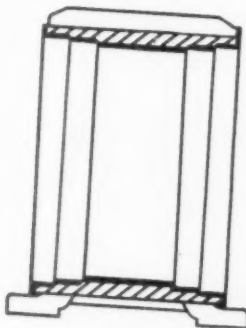


**8 SIZES**

**BORE TO 3  
DIAMETERS  
AND FACE** BOTH SIDES

**31 MOTOR  
FRAMES**

PER HOUR



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to help you solve your problems in  
Drilling, Boring, Facing and Tapping.



**NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana**

*Branch Offices*

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*A Standard to Follow*

## T. I. DRIVE INTERCHANGEABLE COUNTERBORES HIGH SPEED - CARBIDE TIPPED



There are 6 outstanding reasons why our T.I. Drive tools excell all others, this you can find out by just asking for one of our new #53 catalogs.

Standard interchangeable counterbores carried in stock for immediate shipment, in both high-speed and carbide-tipped.

Specials designed and made to order on short notice.

Your first order will demonstrate the merits.

## T.I. Drive

Taper.  
Interchangeable.  
Never freezes.  
Double pin  
powerful drive.  
Rigid.  
Centralizes tool.  
Accurate and  
dependable.



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### THE FALCON TOOL CO.

PLANT & OFFICES 20777 RYAN ROAD  
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WHAT DOES FIRTH STERLING OFFER YOU?

(ANSWER NUMBER 4)

# RESEARCH THAT ANTICIPATES TOMORROW'S NEEDS

Our objective is to help *you* solve the technical and metallurgical problems of an *atomic age before* they arise . . . not *after*. So, at Firth Sterling, constant emphasis is on full-scale research, development, and production in specialty steels, carbides, new metals, and new methods.

Out of this determination to be ahead, not just abreast of need, has come this amazing three year record of achievement in *your* interest:

- A method of heat tinting that makes *Color Metallography* practical for determining the exact structure-property relationship of carbide mixtures.
- New metals of great present and future potential that include heavy metal, three grades of chromium carbide, titanium carbide, and high temperature alloys.
- Cermets—those amazing hybrids of ceramic and metal, possessing in *combination* the best characteristics of each, to overcome modern technological problems.
- Zirconium—in ingot, billet, bar, rod, strip, sheet, wire, and tubing form—soon to be available for industrial applications.
- A new chemical plant, employing the most advanced processes and equipment, producing ammonium paratungstate of the highest *purity* to improve the quality of our tungsten carbides.
- Method "X"—an electro-mechanical process for machining metals that are unmachinable by conventional means.

Yes, all these are the result of "accent on research" . . . the justification for our statement

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—INC—

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OFFICES AND WAREHOUSES: BIRMINGHAM\* CHICAGO CLEVELAND DAYTON\* DETROIT HARTFORD  
HOUSTON\* LOS ANGELES NEW YORK\* PHILADELPHIA\* PITTSBURGH\* WASHINGTON\* WESTFIELD, N.J.\*

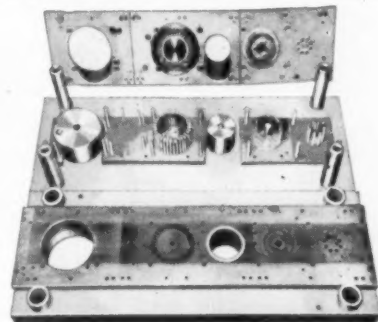
## A VERSATILE FAMILY OF *Tool and Die Steels.*

CROMOVAN • AIRVAN • INVARO

Certain steels or families of steel stand out as having almost universal application for general use, ranging from moderate to high production as job requirements demand. One such Firth Sterling family of steels consists of CROMOVAN, AIRVAN, and INVARO. CROMOVAN and AIRVAN are air hardening; INVARO is oil hardening.

### ANALYSES

	CROMOVAN	AIRVAN	INVARO
Carbon	1.60%	1.00%	.90%
Chromium	12.50%	5.25%	.50%
Vanadium	1.00%	.25%	.20%
Molybdenum	1.00%	1.15%	—
Manganese	—	—	1.15%
Tungsten	—	—	.50%



Generally speaking, CROMOVAN is intended for long production runs where hundreds of thousands or millions of pieces must be produced at minimum cost; AIRVAN for intermediate runs where toughness and high abrasion resistance are also requirements; INVARO, an oil hardening tool steel for all other general use.

Full technical details are available in these free bulletins. Write for them today or ask your Firth Sterling representative to call and discuss your tool and die needs . . . steel or carbide.



### PRODUCTS OF FIRTH STERLING METALLURGY

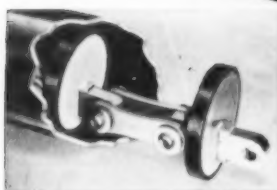
High Speed Steels  
Tool & Die Steels  
Stainless Specialties  
High Temperature Alloys



Sintered Tungsten Carbides  
Firth Heavy Metal  
Chromium Carbides  
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# HERE'S HELP!

SHOW YOUR MANAGEMENT  
**BIG SAVINGS** WITH  
*Hapman* CONVEYORS



**FOR METAL CHIP AND  
DUST REMOVAL ON  
3 TYPES OF  
INSTALLATIONS:**

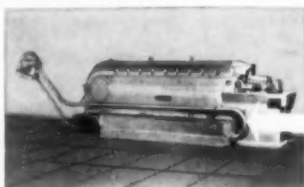
## DEPARTMENT OR PLANT-WIDE CHIP-CONVEYING SYSTEMS...

Here's the latest of many complete Hapman chip-handling systems installed in major automotive plants. In all cases, they've *proved* their ability to pay big dividends fast.



## AS ORIGINAL COMPONENTS ON NEW MACHINES AND EQUIPMENT...

You can get low-cost, *auto-matic* chip, dust or sludge removal on new machines of many types by specifying Hapman Conveyors as original equipment. We co-operate with the tool builder.



## ADDED TO EXISTING MACHINES OF MANY TYPES...

You can also show your Management important, quick-return savings by installing Hapman Conveyors on existing equipment such as these profile milling machines — or on broaching machines, grinders, drills, quench tanks, etc. You can *prove* the savings —



**INVESTIGATE NOW** — WRITE FOR BULLETIN TE-354

*Hapman* CONVEYORS, INC.  
DIVISION HAPMAN-DUTTON COMPANY  
KALAMAZOO MICHIGAN

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## GROBET CHATTERLESS COUNTERSINKS

They are terrifically popular because the six staggered cutting edges are scientifically designed to give a shearing cut and thus eliminate all chatter. Made in 12 sizes in all degrees; also supplied as sets in strong Kit-cases.



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Catalog



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with a *Adjustable* **MULTI-DRILL**

**DRILLS  
2 to 8  
HOLES  
at ONE  
STROKE**

Increase production up to 800% ... save time, cut costs. MULTI-DRILLS make any drill press produce *more*. Attached without alterations or special tools. Quick, easy setups of universally adjustable spindles give you more flexibility ... wider application. Handles any hole pattern within 9" circle; centers close as 1/8". Extension Spindles available to increase working area to 22 1/2". Special adaptations available.



model  
900

**DRILLS ANY  
HOLE  
PATTERN**



See your Commander Distributor for complete details. Write for the NEW Commander Full Line Catalog #851.

**COMMANDER MFG. CO.**

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Product of *Commander*... Builder of Production Tools

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The Tool Engineer



## measuring up

...and **REX** is the standard  
by which all high speed  
steels are compared

An older brother sometimes makes a handy yardstick for measuring junior's growth. And when it comes to tool steels, REX® High Speed Steel is — and has been for over 50 years — the standard of comparison.

There's no mystery to REX High Speed Steel. Its quality has been time-tested in thousands of shops. And after all, it's performance — not claims — that really counts. Make your *own* comparison test. Put REX High Speed Steel to work. Compare its structure, finish, hardenability, carbide distribution and general uniformity. You won't find another high speed steel that surpasses REX.

Remember, too, that even though it is widely distributed and used, REX High Speed Steel is made *only* by Crucible. So for tops in high speed steel performance, be sure you order the Crucible REX brand.



# CRUCIBLE

first name in special purpose steels

54 years of *Fine* steelmaking

## TOOL STEELS

CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.

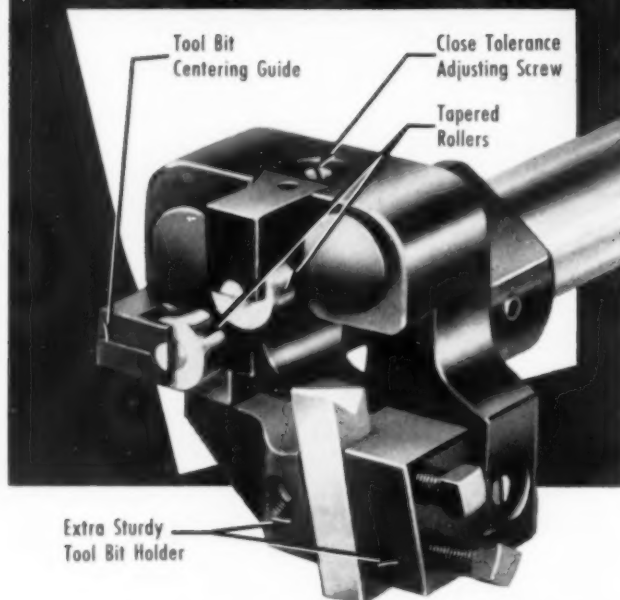
March, 1954

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-259

259

## BOYAR-SCHULTZ SCREW MACHINE TOOLS

Standard Equipment  
in Progressive Shops



### MODEL T TURNING TOOL

For automatic or hand screw machines as well as turret lathes. A box tool with the stamina to deliver piece after piece to close tolerance over long production runs. An outstanding feature is the speed with which set-up is accomplished. A predetermined center line on the roller block provides for rapid return of re-sharpened bits to precisely the same cutting position with a minimum of down-time.

### More Production—Less Down-Time

Boyar-Schultz Screw Machine Tools are designed and built to eliminate the difficulties that ordinarily confront the screw machine operator.

Correct design and built-in sturdiness evident in Boyar-Schultz Tools, are the reasons for their close tolerance accuracy that contribute so much to profitable screw machine operation. Carried in stock for immediate delivery.

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|--|-----------------------------------|
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| ● Model C for Burnishing               | ● Model AP for Pointing           |
| ● Model DRH Drill and Reamer Holder    | ● Model H Box Tool Adapter        |
| ● Model DA for Deep Hole Drilling      | ● Model RS Revolving Stop         |
| ● Model K for Knurling                 | ● Model RR Roller Rest            |
| ● Model A-T Tap Holder (Non-Releasing) | ● Chucking Levers                 |
|  | ● Cam Rollers and Pins            |
|  | ● Model G Grinding Fixture        |

Write for Descriptive Literature

**BOYAR-SCHULTZ Corporation**

2105 Walnut St. Dept. DS Chicago 12

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Precision tapping costs less  
on your drill press with

**"Auto-tap"**  
TRADE MARK

LEAD SCREW TAPPING  
ATTACHMENT

- Utilizes unskilled help and low-cost equipment
- Less scrap means more profits for you
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- Prices for interchangeable lead screw and support arm start at

**\$59<sup>50</sup>**

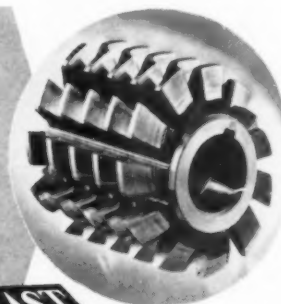
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*Automatic Methods*  
PRECISION PARTS FOR AIRCRAFT

944C West Grand St.  
INC. Elizabeth, N. J.

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**terrific  
INCREASE  
in HOB life  
proven by**



Here are the amazing results of  
Vapor Blasting HOBs in a leading  
axle manufacturing plant:

- Increased Hob Life by over 315 %
- Reduced Hob Cost by ONE HALF
- Required less metal removed per grinding
- Released grinding operators time for other work

New Hobs average 76 pieces.  
Vapor Blasted Hobs averaged 240  
pieces — and produced up to 430 pieces.

If you use tools — hobs, taps, cutters,  
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HONING can probably save its cost for  
you, too. Write for details — or send a  
part for laboratory processing.

SEE VAPOR BLAST LIQUID HONING  
at BOOTH 1747  
ASTE Industrial Exposition  
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**VAPOR BLAST MFG. CO.**

3055C W. Atkinson Ave., Milwaukee 16, Wis.



Vapor Blast Model 3030,  
Type B20 — One of 5 stand-  
ard self-contained models.

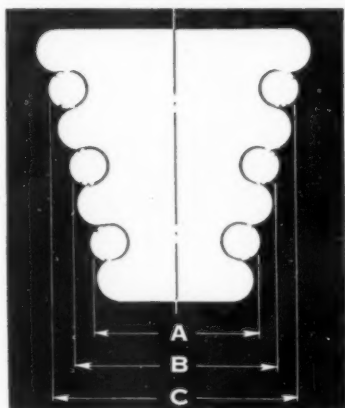
"Vapor Blast" is a trademark.  
"Liquid Honing" is a trademark.

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The Tool Engineer

# New Taft-Peirce CompAIRator Air Gage *Measures and Computes*

**4 DIMENSIONS  
SIMULTANEOUSLY**



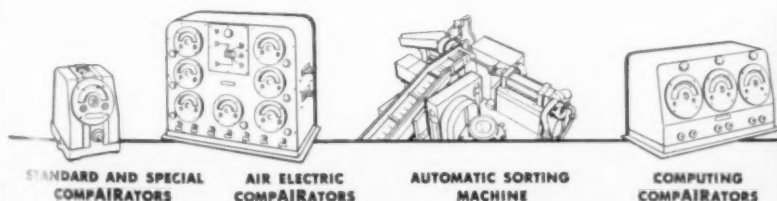
The CompAIRator above checks serrations in the root section of jet engine turbine blades. Does automatically and instantly what formerly took skilled hands many minutes to do.

Three of the air indicators measure thickness "over rolls" of the serrated sections. At the same time, a T-P Computing CompAIRator computes the difference between two of these dimensions and compares it to a standard

value. If the variation is greater than plus or minus .001" on the dial, the part is rejected. Most important of all, the serrations can be checked over their entire length.

Two different models of this gage have been built. One permits gaging with the part in the grinding fixture — thus eliminating many costly rejects. The other serves as a final inspection gage.

This unit is typical of the hundreds of Taft-Peirce CompAIRators now simplifying complicated gaging operations. For more information on this and many other items, send for your copy of the Taft-Peirce Handbook.

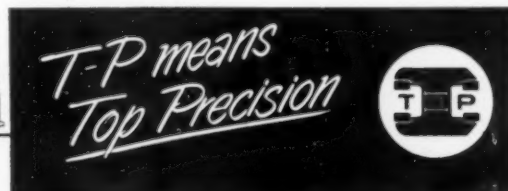


STANDARD AND SPECIAL  
COMPAIRATORS

AIR ELECTRIC  
COMPAIRATORS

AUTOMATIC SORTING  
MACHINE

COMPUTING  
COMPAIRATORS



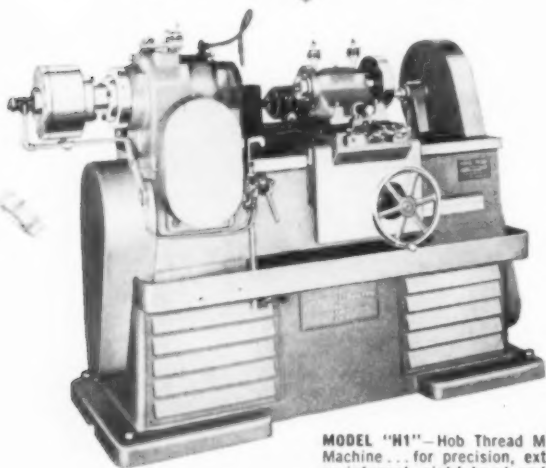
**THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, R. I.**

March, 1954

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-261

261

mass-produced with  
uninterrupted  
accuracy



MODEL "W1"—Hob Thread Milling Machine... for precision, external or internal, right hand and left hand threads... AUTOMATICALLY!

when threaded on

**COULTER**

**AUTOMATIC  
THREADING  
MACHINES**

Speed up your production with one of the 3 COULTER Automatic Threading Machines for faster, better, and lower production cost parts. Insure yourself with the greatest margin of profits, yet produce parts with uncanny precision, perfect threading and have wide range versatility. Now you can be far ahead of all your delivery schedules. You can thread parts to desired lengths and diameters, use the metals your specifications require, and get a quality product on COULTER'S amazing threading machines. Everything is automatic.

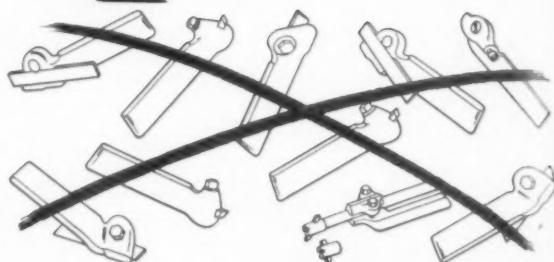
*Without obligation, consult our engineering staff with your specific threading problems. Catalog and machine specifications available upon request.*

MACHINE TOOL BUILDERS SINCE 1896  
**The James Coulter Machine Co.**

645 Railroad Ave. Bridgeport 5, Conn.

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**ONE ALL PURPOSE  
TOOL HOLDER  
INSTEAD OF  
TEN**



ONE tool holder for all positions—No tool chatter—can do internal boring or internal threading—Ideal for carbide tools—Bit sizes: 1/4", 5/16", 3/8", 7/16", 1/2", 5/8".

**ACME TOOL COMPANY**

75 W. BROADWAY

NEW YORK 7, N. Y.

USE READER SERVICE CARD; INDICATE A-3-262-2

***NOW*** Dial Bore Gages  
can be set  
to an  
**adjustable  
master**



Boice Dial Bore Gage in a Boice Setmaster. Wear surface has carbide insert.

The Boice Dial Bore Gage Setmaster is adjustable so that it can be set to a given dimension with gage blocks. It is locked and sealed and then used on the job as the setting master for the Boice Dial Bore Gage. Write for Bulletin 6A.

**BOICE** MANUFACTURING COMPANY, INC.  
STAATSBURG, NEW YORK  
DIAL GAGES BY BOICE "INDICATES QUALITY"

USE READER SERVICE CARD; INDICATE A-3-262-3

The Tool Engineer



## CHASERS IN OR OUT IN SECONDS

Quick chaser insertion and removal means less down time on threading jobs, and it's a big feature of GEOMETRIC "D" type Die Heads.

Just pull up a stop plunger and snap the chasers in or out of their slots in less time than it takes to tell how. No face plate to remove, no screws to replace, no parts to adjust.

Simple to operate, rugged, precision built. That's the GEOMETRIC "D", industry's BASIC DIE HEAD, the one to which all others are compared.

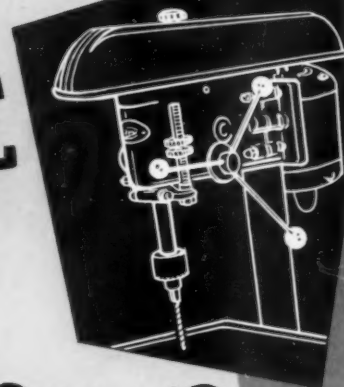
*Write for full details. Specify Bulletin D*

*Greenfield Tap and Die Corporation*  
**GEOMETRIC TOOL COMPANY DIVISION**  
NEW HAVEN 15, CONNECTICUT





# Why Pay "COFFEE TIME" To a Drill Press?



A drill press makes money only when the tool is cutting. Each second the spindle stands idle is a dead load on overhead.

Unfortunately, actual machining time in drilling, tapping, reaming or counterboring is pretty well fixed by the nature of the tool and material.

But the time taken in getting the tool to and from the material and the material to and from the tool is pretty much up to the ingenuity of the tool engineer. It's here that costs can be cut — added profits made.

It's here that two Bellows "Controlled-Air-Power" Devices can fit into your picture: The Bellows Drill Press Feed and the Bellows Rotary Work Feeder. The Bellows Drill Press Feed attaches to the star wheel shaft of any standard drill press. A touch on

the operating lever and the Feed advances the quill rapidly to the work, feeds the tool under hydraulic control through the work — and returns the quill quickly to starting position. The Bellows Rotary Work Feeder feeds the parts swiftly, accurately and safely to the tool. All the operator has to do is load and unload — the rest is automatic.

Cost reductions can be almost fantastic. In our files are hundreds of case histories telling of savings ranging anywhere from 30% to 80%.

Phone your Bellows Field Engineer. He's listed in your phone book under "The Bellows Co". (In Canada, under Bellows Pneumatic Devices of Canada, Ltd.) Ask him to show you the case history evidence. Or write The Bellows Co. Dept. TE-354, Akron, Ohio for Bulletins DF110 and T85.

**The Bellows co.**  
ESTABLISHED 1911  
AKRON 9, OHIO



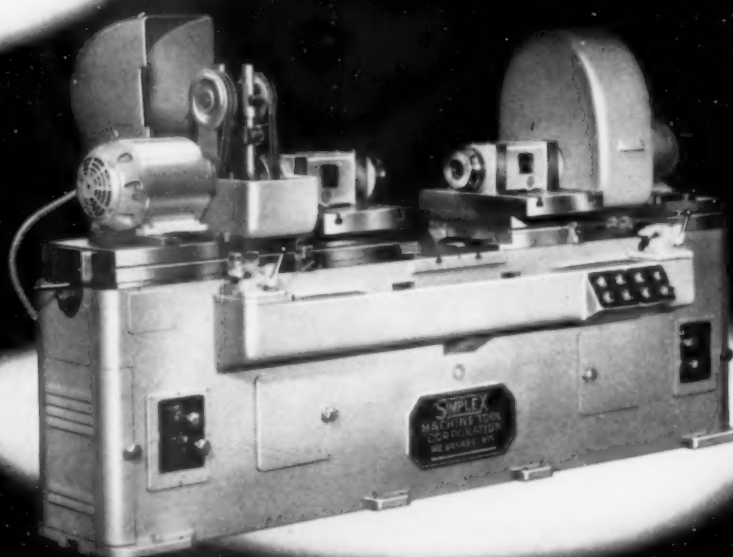
871-A

**CONTROLLED-AIR-POWER FOR FASTER, SAFER, BETTER PRODUCTION**

# Simplex



See these and other machines in operation at our booth, No. 1555, at the Tool Engineers Exposition in Philadelphia, April 26 to 30 inclusive.



**SIMPLEX MACHINE TOOL CORPORATION**

4528 WEST MITCHELL STREET

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PRECISION BORING MACHINES • PLANER TYPE MILLING MACHINES  
SPECIAL DRILLING, TAPPING AND BORING MACHINES



**LEES-BRADNER MODEL R  
HEAVYWEIGHT HOBBER**

Maximum Outside Dia. . . . 16"  
Travel . . . . . 18"  
Maximum Helix . . RH 45°—LH 60°  
Machine Weight . . . 13,000 lbs.  
Motor Requirements . 15 to 25 HP

**Will the Machines You Buy  
Today Fill Tomorrow's Needs?**



How about that machine you're thinking of replacing today? Awhile back it looked pretty good, didn't it? Good enough to fill your needs when you bought it, anyway. But now it can't handle today's job and it must be replaced.

When you buy that new machine—*look ahead*. Don't invest in one that just barely meets today's needs. Think about that extra capacity you'll probably need tomorrow.

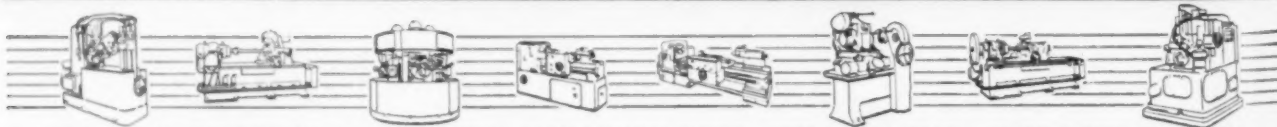
Lees-Bradner manufactures a full line of hobbing machines to meet different requirements. If a smaller capacity machine will do your job today — *and tomorrow* — fine, that's for you.

But if you suspect you'll need higher speeds, faster feeds and greater production capacity in the near future it's wise to gear your thinking and purchasing accordingly.

*the* **LEES-BRADNER**

CLEVELAND 11, OHIO, U.S.A.

*Company*



IF YOU THREAD OR HOB . . . GET A BETTER JOB WITH A LEES-BRADNER

**HOW TOOL UP FOR  
MULTIPLE SAVINGS**

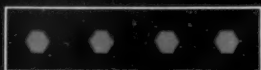
*through . . .*  
**AIR engineering**

*new idea!*

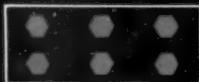
Note in this plant, the Model YD4A Nut Runner in the foreground is tightening differential bearing caps for the machining operations. In the background, a Model YG4A is removing the cap screws prior to final assembly. Each is handling 4 operations at once—substantial saving against single power tool or one-at-a-time operation by hand!

**built to your specifications  
in typical bolt patterns  
like these:**

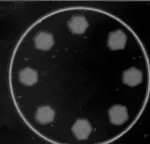
IN LINE



RECTANGULAR



CIRCULAR



Other bolt patterns built to your needs in a wide range of capacities and torque requirements.

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## MULTIPLE NUT-RUNNERS



**2 to 10 nuts--or more . . .  
are driven *simultaneously!***

**I-R Multiple Nut Runners give you:**

- Top "quality control"—Torque is uniform on each and every nut.
- Safe for operator—Torque resistance doesn't exist.
- Instant on-the-job operation—no special training is required by the operator.
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Talk to the I-R representative in your area and get full details on cost-saving Multiple Nut Runners for your specific applications. Meantime, write for latest bulletin which shows how they are built to your specifications.



**Ingersoll-Rand**

11 Broadway, New York 4, N. Y.

**AIR engineering**

*the modern way to faster production*

8-25

# SUPERFINISH

## MAKES THESE PARTS BETTER

### ... 5 WAYS!



You're looking at a group of parts that go into the Gisholt Fastermatic Automatic Turret Lathe. Super-smoothness of working surfaces of these parts is vital to the precision and long life of the machine. So all these parts are Superfinished—including overhead pilot bars, piston rods, hydraulic control valves, thrust collars, turret locating pins and rollers.

#### *The benefits are many:*

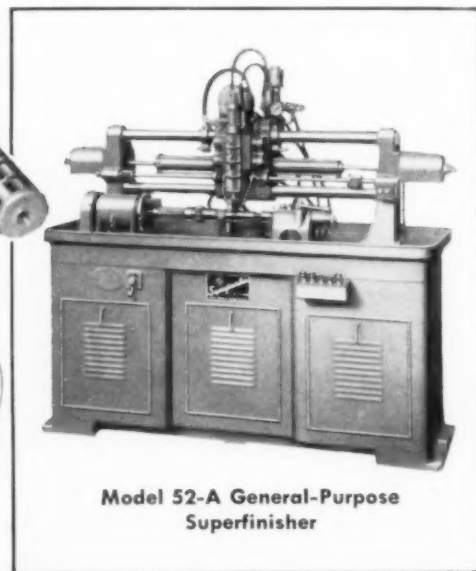
1. Superfinishing removes all chatter marks, grinder flats, "smear metal" and other surface irregularities.
2. It assures more nearly perfect geometrical forms. This means more uniform bearing surfaces. They therefore last far longer.
3. Superfinishing simplifies assembly because the surfaces are down to true "base metal"...and no break-in tolerances are required.
4. Superfinishing simplifies grinding and reduces spoilage.
5. The greater degree of smoothness makes the parts easier operating, reduces wear.

The net result of Superfinish here—as it can be in your case—is parts that perform better, last longer and cost far less in the long run. See how Superfinish can solve your problems of both wear and surface roughness. Get your copy of "Wear and Surface Finish," and complete textbook covering all phases of Superfinish.



#### THE GISHOLT ROUND TABLE

*represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts.  
Your problems are welcomed here.*



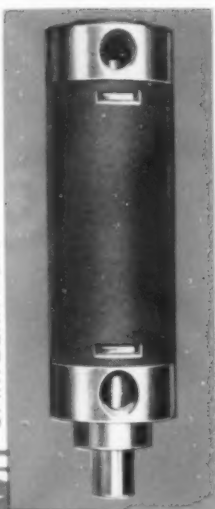
Model 52-A General-Purpose Superfinisher

# GISHOLT

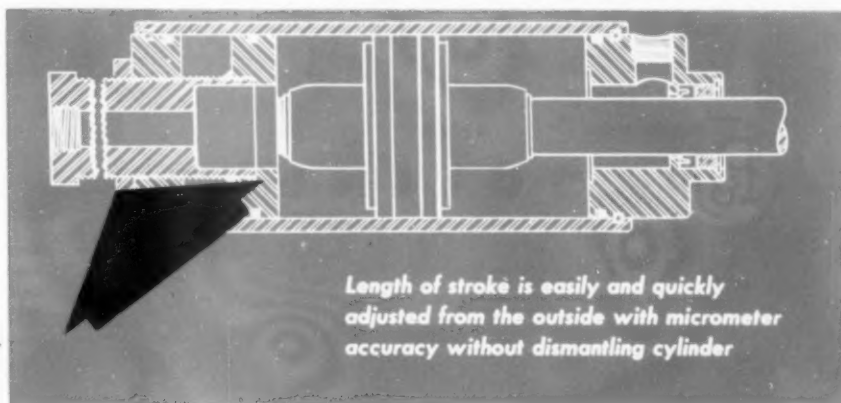
MACHINE COMPANY Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

AIR • HYDRAULIC

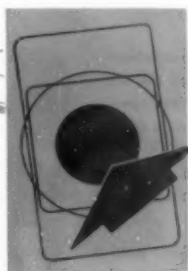


# standard **O-M** cylinders are easily and quickly modified to fit SPECIAL APPLICATIONS



You don't pay for special patterns . . . and you don't have to use a cylinder that's not quite "right" for the job when you choose the O-M Cylinder. Since nearly all parts are standardized in O-M Cylinders (plus one or two semi-standard parts), the additional cost is extremely small when you need a duplex, triplex, adjustable-stroke, tandem—or any other "special" type cylinder for applications not suited to standard units.

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O-M Cylinders require  $\frac{1}{3}$  less installation space than conventional cylinders of the same bore because O-M's SPECIAL INTERLOCKING MECHANISM does away with projecting tie rods and end caps. Also provides better balance, reduces distortion . . . giving O-M the lowest coefficient of friction of any cylinder. End plugs tapped for universal mounting. Any one or combination of mounting brackets may be used to install without disassembling or changing cylinder. Easily removed, inspected, repaired. ALL-STEEL with bearing bronze—no castings.

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Write today for FREE catalog and complete set of  $\frac{1}{2}$ " and  $\frac{1}{4}$ " scale templates showing all cylinders and mounting brackets.

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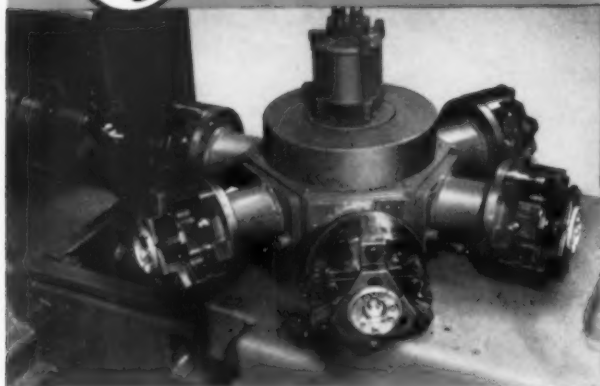
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YOU'RE *RIGHT*  
in the driver's seat  
WITH  
**POTTER & JOHNSTON**  
**3-U SPEED-FLEX**

*Automatic Turret Lathes*



AND  
**TOOLING**



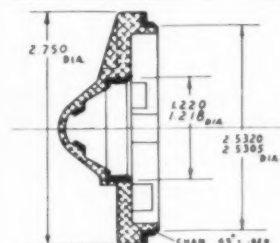
Here is an outstanding example of how Potter & Johnston Automatic Turret Lathes, plus P&J Tooling, puts you in the driver's seat—right out in front of competition. The versatility of the 3-U Speed-Flex permitted mounting the cutting tools in the revolving spindle and chucking the work pieces in the Turret during machining time.

Machine loading time was eliminated, costs lowered, and production greatly increased by the use of air operated chucks on each of the six turret faces. The operator simply inserts the work piece in the open jaws, a stationary air-cylinder (operated by the dog-drum) automatically controlling chuck opening and ejection, and chuck closing. Turret indexing is automatic, rapid and accurate. Idle cutting time is reduced to a minimum . . . the fast, rapid-traverse mechanism moving the turret slide quickly to within  $\frac{1}{4}$ " of feeding position.

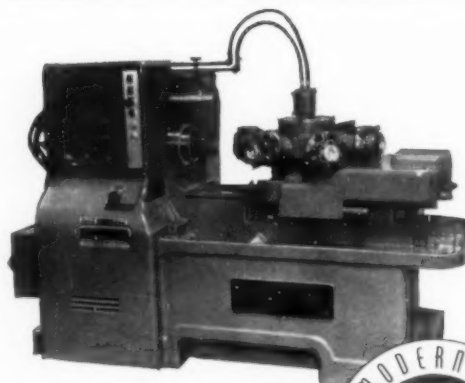
You too can benefit from this combination. At no obligation, send today for your copy of the 3-U Bulletin No. 145 . . . or ask our Tool Engineers to submit recommendations based on your own prints or sample parts.



American Bosch manufactures small electric motors used in seat adjuster mechanism for Lincoln-Mercury and other passenger cars. The aluminum housings required are machined at 170 pieces per hour.



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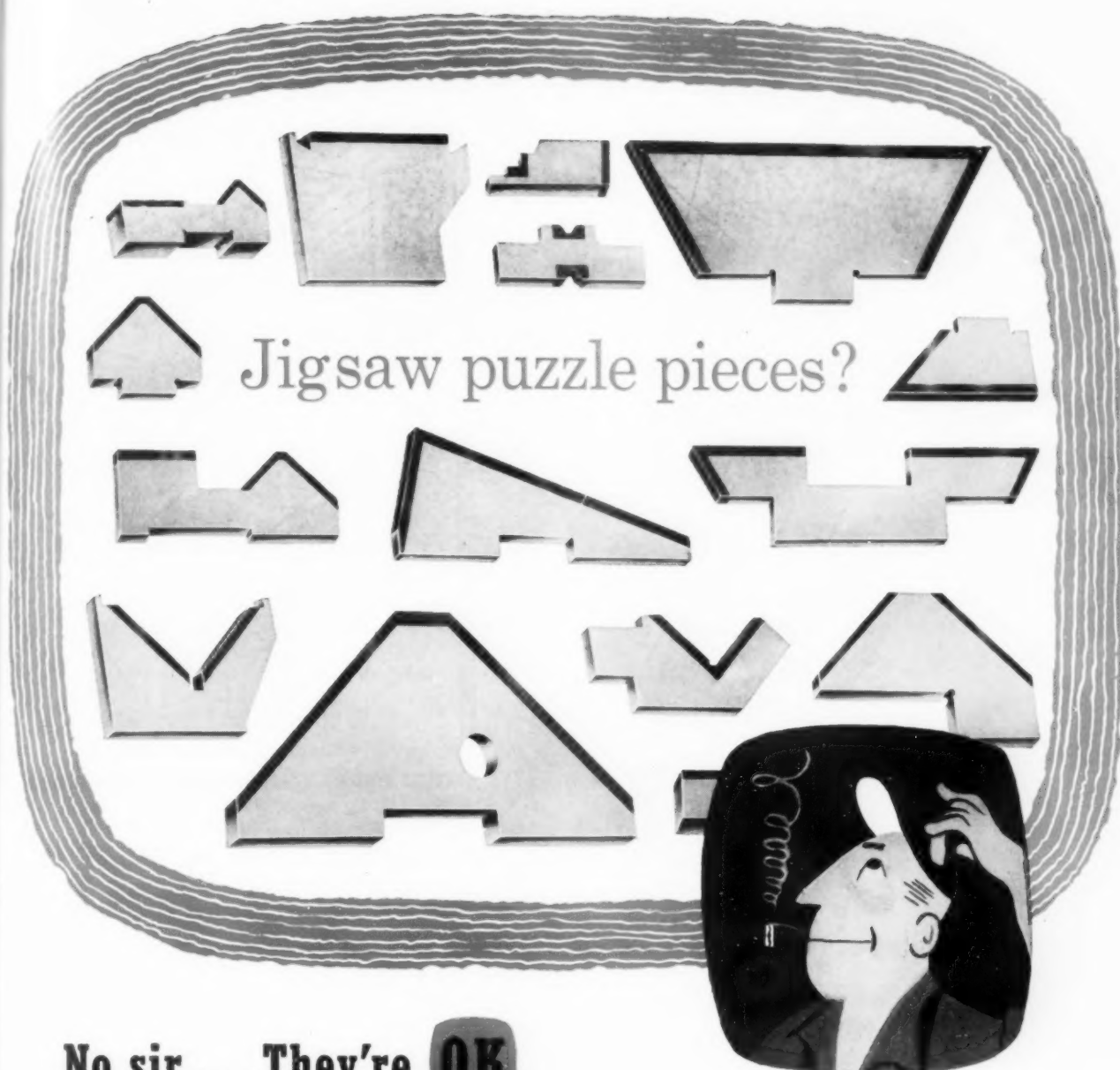


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## No sir... They're **OK** hardened bedway cross sections!

These hardened ways, made by The Ohio Knife Co., give you an idea of the diversified shapes and sizes supplied. OK's special process of manufacture permits building to your specifications in a wide range of design.

Specially heat-treated tool steel makes OK ways practically wear-proof and helps maintain constant accu-

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Through the Ohio Knife process the long-wearing tool steel is welded to a soft steel backing under 2500 tons pressure. Then precision equipment finishes the bedway by grinding to tolerances up to  $\pm .0002$  inches.



**THE OHIO KNIFE CO.**

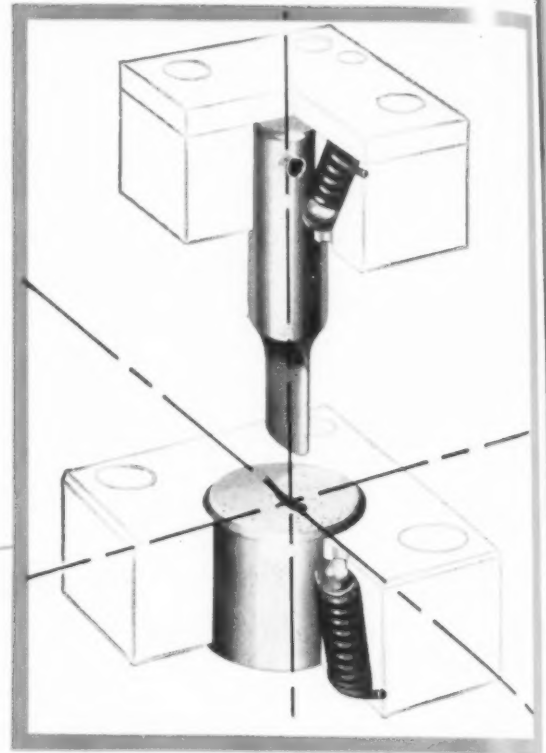
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The Keenest  
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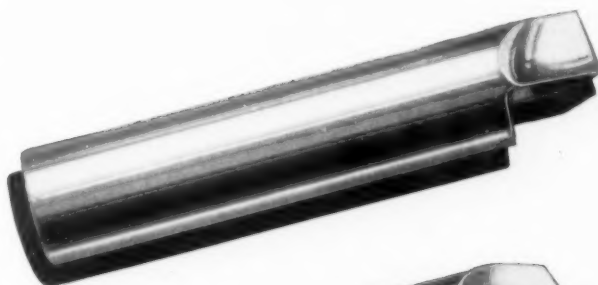
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## Solid Carbide

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The demand has been so great that up to now our supply has been inadequate. Now with new specially designed and built Atrax machines, we're ready to take care of all your needs with these superior tools. We also carry at all times a complete stock of all grades to assure you of fast service.

These Solid Carbide Tool Bits are ground and lapped to produce finer finishes and longer life. Yet this superior quality costs you no more. Why not consult our competent engineering staff on your requirements?



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# **BAY STATE TAPS**

BAY STATE TAP & DIE COMPANY      MANSFIELD, MASS.

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**Safety Chuck Company**

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SIZES: 20" focal lgh. 1 1/2 power — 14" focal lgh., 1 1/4 power, 10" focal lgh., 2 1/4 power; 8" focal lgh., 2 1/2 power . . . . . price each ONLY **10.50**

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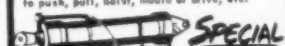
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**The Tool Engineer**



# SIMONDS **Flat Ground** DIE STEEL

## ... OIL or AIR Hardening

Ready for 1001 uses, Simonds "Red Streak" Die Steel offers you a choice of either OIL or AIR Hardening. Made from Simonds own steel, it's precision ground to a thickness limit of plus or minus .001", and has an extra smooth surface finish of 25 to 35 micro inches. Edges and ends are square and parallel, with all scale, decarburization and surface defects removed. All sizes come individually packaged with heat treating instructions.

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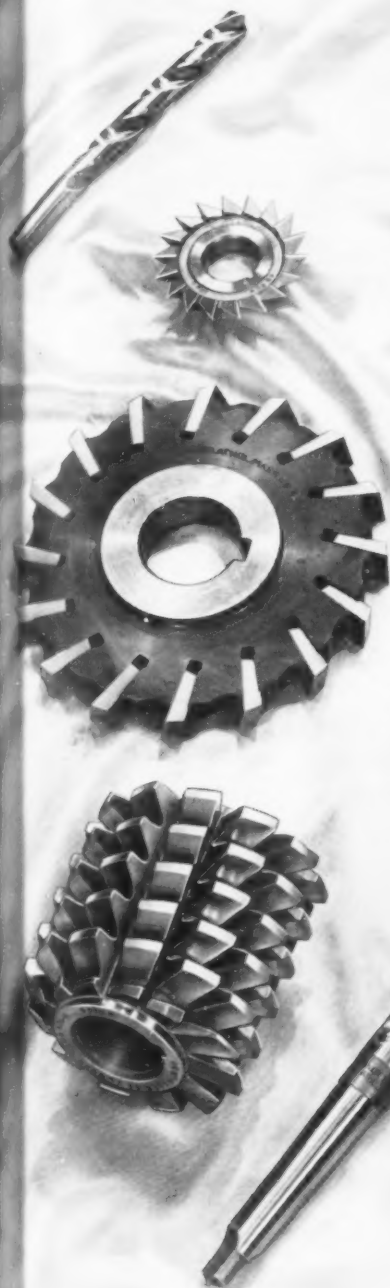
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The "HALIR" violin from the collection of Frederick S. Haenel, Gaylordsville, Conn.

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## March, 1954, Issue

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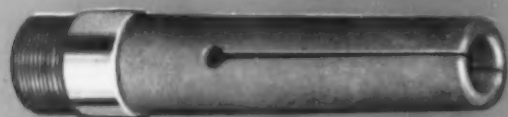
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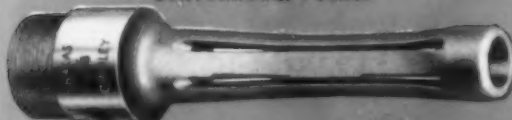
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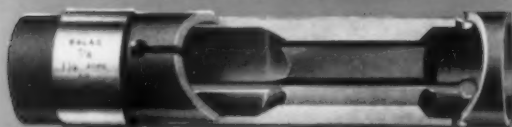
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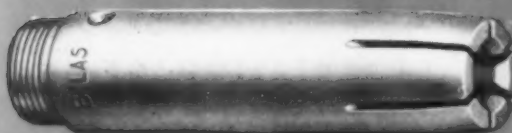
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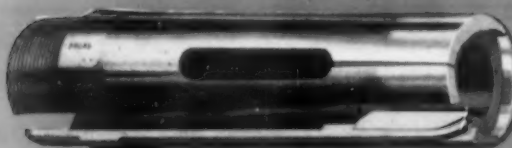
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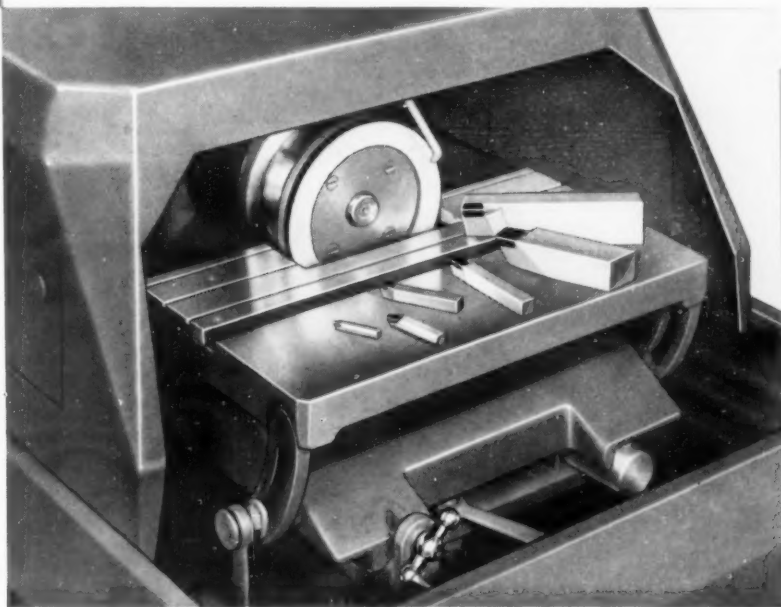
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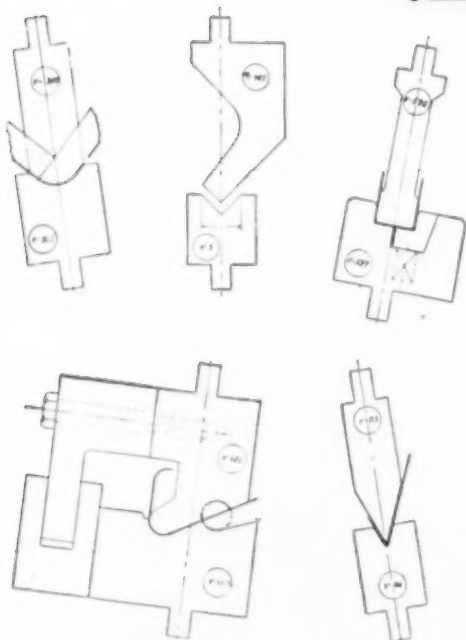
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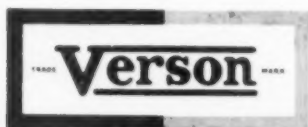
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